Archives of
PHYSICAL MEDICINE

Official Journal American Congress of Physical Medicine

(Formerly Archives of Physical Therapy)

29th Annual Session

AMERICAN CONGRESS OF PHYSICAL MEDICINE

September 4, 5, 6, 7, 8, 1951

SHIRLEY-SAVOY HOTEL DENVER, COLORADO

VOLUME XXXII MAY, 1951 NO. 5

American Congress of Physical Medicine

29th Annual

Scientific and Clinical Session

and

Instruction Seminar

September 4, 5, 6, 7 and 8, 1951

Official Headquarters

SHIRLEY-SAVOY HOTEL

Denver, Colorado

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INSTRUCTION SEMINAR

In Conjunction with the

29th Annual Scientific and Clinical Session
AMERICAN CONGRESS OF PHYSICAL MEDICINE

September 4, 5, 6 and 7, 1951

SHIRLEY-SAVOY HOTEL **DENVER, COLORADO**

SCHEDULE

Physicians and registered physical and occupational therapists may enroll for either series

TUESDAY MORNING — SEPTEMBER 4	
(A) 10:00-10:50 A.M. Electromyograph, Basic Principles (with demonstration) — Golseth	(B) 11:00-11:50 A.M. Electromyography Clinical Aspects — Golseth
TUESDAY AFTERNOON — SEPTEMBER 4	
(C) 1:30-2:20 P.M. Functional Anatomy Spine and Trunk	(D) 2:30-3:20 P.M. Functional Anatomy Spine and Trunk
WEDNESDAY MORNING — SEPTEMBER 5	
(E) 8:30-9:20 A.M. Deconditioning in the Invalid and the Aged — Taylor	(F) 9:30-10:20 A.M. Deconditioning in the Invalid and the Aged — Taylor
THURSDAY MORNING — SEPTEMBER 6	
(G) 8:30-9:20 A.M. Electrical Stimulation — Types of Current and Clinical Physiology — Kubicek	(H) 9:30-10:20 A.M. Electrical Stimulation — Types of Current and Clinical Physiology — Kubicek
FRIDAY MORNING — SEPTEMBER 7	
(J) 8:30-9:20 A.M. Technique of Scientific Medical Writing — Hammond	(K) 9:30-10:20 A.M. Technique of Scientific Medical Writing — Hammond

TUESDAY MORNING — SEPTEMBER 4	
(1) 10:00-10:50 A.M. Scoliosis: Causes, Prognosis, Physical Treatment	(2) 11:00-11:50 A.M. Hemiplegia Physical Rehabilitation — Deaver
TUESDAY AFTERNOON — SEPTEMBER 4	
(3) 1:30-2:20 P.M. Low Back Pain with Reference to Manipulation — Wright	(4) 2:30-3:20 P.M. Post Reduction Treatment of Fractures — E. Krusen, Jr.
WEDNESDAY MORNING — SEPTEMBER 5	
(5) 8:30-9:20 A.M. Crutch Walking with Demonstration — Deaver	(6) 9:30-10:20 A.M. Physical Treatment of Peripheral Nerve Lesions — Kuitert
THURSDAY MORNING — SEPTEMBER 6	
(7) 8:30-9:20 A.M. Treatment of Rheumatoid Derelicts by Hormonal Therapy, Orthopedic Procedures and Rehabilitation — Bickel	(8) 9:30-10:20 A.M. Essentials of Muscle Testing (with demonstration) — Knapp
FRIDAY MORNING — SEPTEMBER 7	
(9) 8:30-9:20 A.M. Essentials of Muscle Reeducation (with demonstration) — Kendell	(10) 9:30-10:20 A.M. Occupational Therapy: Prescription Writing — Mead

Note: The Committee on Education of the American Congress of Physical Medicine is in charge of the instruction seminar. It is purposely planned to limit the subjects in any year to a few topics in order to devote enough time to those subjects to give those attending a good review, both from the standpoint of basic knowledge and from the clinical standpoint. Certain groups of these subjects will be repeated every three to five years.

Courses will be offered in two separate groups: One group of ten courses will be offered on basic subjects. A second group of ten courses will present more general and clinical subjects. Physicians and therapists may register for letter or numbered series. Only those therapists registered with the American Registry of Physical Therapists or the American Occupational Therapy Association will be permitted to enroll for the instruction courses. The charge for a single lecture is $2.00, for a full schedule of ten lectures, $15.00.

For full information and application form address

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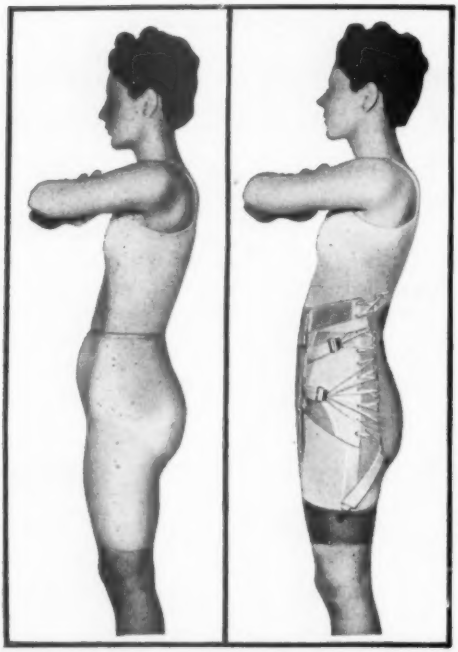

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ORIGINAL ARTICLES

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EDITOR OF THE MONTH

ARTHUR L. WATKINS, M.D.
Boston, Massachusetts

Printed in U.S.A.

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PHYSICAL MEDICINE **

The following services are approved by the Council on Medical Education and Hospitals of the American Medical Association and the American Board of Physical Medicine and Rehabilitation. Residencies in this specialty have been approved without specifying the number of years for which they are accredited. The Board will give appropriate credit for training in these hospitals on an individual basis.

Hospitals, 42 Assistant Residencies and Residencies, 55

Name of Hospital	Location	Chief of Service	Inpatients Treated	Number of Treatments	Asst. Res. & Residencies Offered [2]	Beginning of Service (1950)	Beginning Stipend (Month)
United States Army							
Letterman General Hospital★	San Francisco	A. E. White	21,861	185,113	2	1/1, 7/1	n
†Fitzsimons General Hospital★	Denver	H. B. Luscombe	21,090	281,585	4	.....	n
Army Medical Center★	Washington, D. C.	E. M. Smith	8,676	134,137	6	7/1	n
Veterans Administration							
†Veterans Admin. Hospital [1]	Ft. Logan, Colo.	F. J. Fricke	4,610	58,879	1	.....	n
Veterans Admin. Hospital	Chamblee, Ga.	G. D. Williams	4,923	39,181	1	7/1	n
Veterans Admin. Hospital	Hines, Ill.	L. B. Newman	20,052	472,950	2	1/1, 7/1	n
Veterans Admin. Hospital	New Orleans	S. Winokur	1,107	49,815	1	7/1	n
Veterans Admin. Hospital [1]	Framingham, Mass.	F. Friedland	9,000	24,000	2	7/1	n
Veterans Admin. Hospital [1]	Jefferson Bks., Mo.	S. Mead	4,046	53,920	2	7/1	n
†Veterans Admin. Hospital [1]	New York City	K. Harpuder	12,613	279,817	3	1/1, 7/1	n
Veterans Admin. Hospital [1]	Cleveland	H. T. Zankel	2,452	105,000	2	7/1	n
†Veterans Admin. Hospital	Aspinwall, Pa.	S. Machover	1,993	62,792	1	7/1	n
†Veterans Admin. Hospital	Portland, Ore.	E. W. Fowlks	4,395	96,766	1	1/1, 7/1	n
Nonfederal							
Los Angeles County Hospital★[1]	Los Angeles	O. L. Huddleston	.....	133,694	1	Varies	$165.00
White Memorial Hospital★	Los Angeles	F. B. Moor	33,606	.....	....	.....	120.00
Stanford University Hospitals★[1]	San Francisco	W. H. Northway	.....	6,833	....	7/1	50.00
University of Colorado Medical Center Colorado General Hospital★[1]	Denver	H. L. Dinken	2,322	25,088	1	7/1	75.00
†Emory University Hospital★	Emory Univ., Ga.	R. La Bennett	9,848	20,266	1	7/1	50.00
†Georgia Warm Springs Foundation	Warm Springs, Ga.	.....	889	1,108	2	.....	.....
Cook County Hospital★[1]	Chicago	D. Kobak	3,357	33,282	....	1/1, 7/1	.....
Michael Reese Hospital★[1]	Chicago	C. O. Molander	1,507	19,443	1	Varies	25.00
Northwestern University Medical School	Chicago	.....	13,284	34,813	....	.....	.....
University of Kansas Medical Center★	Kansas City, Kan.	D. L. Rose	11,684	31,838	1	7/1	100.00
†Massachusettts General Hospital★	Boston	.....	.....	.....	....	.....	.....
University of Minnesota Hospitals★[1]	Minneapolis	M. Knapp	15,391	21,885	4	.....	105.00
Mayo Foundation	Rochester, Minn.	F. H. Krusen	.....	.....	9	Varies	92.50
Barnes Hospitals★	St. Louis	.....	820	10,951	....	7/1	25.00
†Bellevue Hospital, Div. III— New York University★	New York City	.....	.....	.....	....	.....	.....
Goldwater Memorial Hospital★[1]	New York City	.....	2,789	124,357	....	.....	.....
†Hospital for Joint Diseases★[1]	New York City	J. Weiss	76,070	93,036	1	7/1	40.00
Hospital for Special Surgery	New York City	K. G. Hansson	.....	41,111	....	.....	.....
Montefiore Hosp., for Chronic Diseases★[1]	New York City	K. Harpuder	.....	.....	....	.....	.....
Mount Sinai Hospital★	New York City	W. Bierman	.....	.....	....	7/1	50.00
New York City Hospital★[1]	New York City	F. K. Safford, Jr.	955	26,418	....	.....	.....
†Presbyterian Hospital ★[3]	New York City	W. B. Snow	70,405	191,021	2	1/1	41.66
St. Luke's Hospital★	New York City	R. Muller	1,202	126,904	1	7/1	50.00
†Rehabilitation Hospital [1]	W. Haverstraw, N.Y.	M. Hoberman	322	291,115	1	.....	200.00
Cleveland Clinic Hospital [1]	Cleveland	S. G. Gamble	17,885	17,884	1	7/1	135.00
Hospital of the Univ. of Pennsylvania★[1]	Philadelphia	G. M. Piersol	1,396	15,575	1	Varies	100.00
Philadelphia General Hospital★[1]	Philadelphia	.....	3,073	21,769	....	.....	.....
Medical College of Virginia, Hosp. Div.★[1]	Richmond, Va.	F. A. Hellebrandt	3,787	34,009	....	.....	.....
State of Wisconsin General Hospital★[1]	Madison, Wis.	H. D. Bouman	3,783	46,840	....	.....	.....

The star (★ indicates hospitals approved for training interns.
The dagger (†) indicates temporary approval.
[1] Residencies open to women.
[2] Includes Fellowships.
n Salary established by government pay tables.

** Reprinted in part J. A. M. A. 142:1196 (April 15) 1950.

SECTION ON

PHYSICAL MEDICINE AND REHABILITATION

AMERICAN MEDICAL ASSOCIATION

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June 11, 12, 13, 14, 15, 1951

Meets in Ocean Room of Hotel Marlborough-Blenheim

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WEDNESDAY, JUNE 13 — 9 a.m.

Treatment of Some Complications of Colles' Fracture
Miland E. Knapp and Myron D. Lecklitner, Minneapolis

Protective Body Mechanics in Arthritis
Jessie Wright, Pittsburgh

Physical Medicine Plus Cortisone for Rheumatoid Arthritis
Gordon M. Martin, Howard F. Polley and Thomas P. Anderson, Rochester, Minn.

Changing Attitudes Toward Multiple Sclerosis: A Program of Management
Edward E. Gordon and Karl E. Carlson, New York

Physical Medicine and Rehabilitation: Dynamic Therapy in Chronic Illness
A. B. C. Knudson, Washington, D. C.

Physical Medicine and Rehabilitation: Its Contribution and Role in a Large Psychiatric Hospital
Daniel Dancik, Northport, N. Y.

THURSDAY, JUNE 14 — 9 a.m.

ELECTION OF OFFICERS

Chairman's Address: The Present Obligation of Physical Medicine and Rehabilitation
George Morris Piersol, Philadelphia

Bell's Palsy
William Bierman, New York

Common Diseases and Disabilities of the Hand
John H. Kuitert and Raoul C. Psaki, Washington, D. C.

Common Lame Backs: Some Causes and Conservative Treatment
Frank R. Ober, Boston

Rehabilitation of Hand Function in Rheumatoid Arthritis
Donald L. Rose, Kansas City, Kan.

Assistive Devices in General Practice
H. Worley Kendell, Chicago

FRIDAY, JUNE 15 — 9 a.m.

Practical Applications of Progressive Resistance Exercises
Arthur L. Watkins, Boston.

Limitations of Ultrasonics in Medicine
Herman Schwan, Philadelphia

Some Clinical Aspects of Cerebral Palsy
M. A. Perlstein, Chicago

Rehabilitation of the Amputee
Henry H. Kessler, Newark, N. J.

Functional Apparatus for Severely Weakened Upper Extremities
Robert L. Bennett, Warm Springs Foundation, Ga.

Bracing of Soft Tissue Disabilities of the Upper Extremity
Charles D. Shields and E. M. Smith, Washington, D. C.

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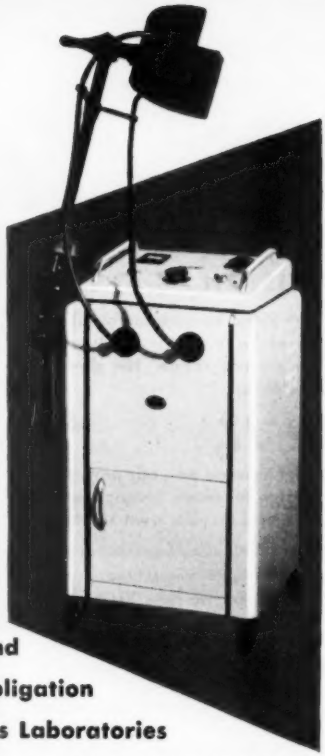

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ECONOMIC FACTORS INVOLVED IN THE OCCUPATIONAL THERAPY PROGRAM OF A GENERAL HOSPITAL *

WILLIAM BENHAM SNOW, M.D.‡

and

HELEN M. WHITE, A.M., O.T.R.‡

NEW YORK

Occupational therapy in a general hospital is dependent upon the appreciation of the medical staff of the method of its utilization. Much conflict in opinion exists as to the role it plays in hospital practice. The position of occupational therapy in a general hospital differs widely from its use in a tuberculosis, psychiatric, or rehabilitation institution. Occupational therapy may be subject to abuse in a general hospital if it is made too available. In recent years the mounting cost of patients' care has forced hospital operatives to streamline all the services to patients wherever possible. The therapeutic effectiveness of the newer pharmaceuticals, and the thoughtful consideration of all the various facets of protracted hospitalization, psychological and physiological, have resulted in shorter hospital stay of both medical and surgical patients. Increased appreciation and utilization of physical medicine toward more intensive rehabilitation, along with the other factors enumerated, have completely altered the face of the hospital picture.

Prior to six years ago, occupational therapy at the Presbyterian Hospital and throughout the Columbia Presbyterian Medical Center was an independent service freely available to the total medical staff, but directed by an occupational therapist accountable to one of the women's auxiliary lay committees. More recently it has been placed under medical direction together with physical therapy, and a department of physical and occupational therapy has been established. Medical direction is necessary if occupational therapy is to have voice and status in a hospital. Presbyterian Hospital is a general teaching institution with an average three-week bed turnover. In spite of this fact, some of these patients remain for longer periods because of the nature of their disabilities and the length of time required for treatment.

Medical examinations, nursing routines, visitors, correspondence, meals, radio, card playing, television, circulating library, and idle conversation keep the average patient quite busy during his hospitalization. The question of how much responsibility the hospital should assume in entertaining the occupants of beds is a pertinent one. What would these same persons do with their time if they were not in the hospital? Is time for meditation a part of modern life, or must people today be actively amused all of their waking hours? We will not attempt to answer these questions but will state that a physician, with his understanding of disease and psyche, appreciates that occupation prevents anxiety.

Early surveys disclosed the following deficiencies in the occupational therapy department at Columbia Presbyterian Medical Center:

1. Preponderance of prescriptions with purely diversional purpose (80 per cent).
2. Lack of knowledge of the medical staff as to the potentiality of occupational therapy for kinetic uses (improvement of physical function).

* Read at the Twenty-Eighth Annual Session of the American Congress of Physical Medicine, Boston, Aug. 30, 1950.

‡ Director, Physical and Occupational Therapy Department (Dr. Snow) and Head Occupational Therapist (Mrs. White), Columbia Presbyterian Medical Center.

3. Too much knitting and weaving and too little modern equipment and diverse modalities.
4. Need for physical rehabilitation of the occupational therapy shops.
5. Need of continued staff education and heightened morale.
6. Salary readjustments of therapists.
7. Energetic leadership.

Our hospital administration was made aware of the situation and has stood by and been most helpful to the department in meeting our problem.

This paper will deal with economies, income, outlay, education, and the abuses of diversional occupational therapy.

Occupational therapy service is costly unless provided under a unit charge plan, and it is difficult to collect for some of its services. Patients regard finite services as rational charges. Simple amusement is assumed by the average patient to be a part of his general care. It is even difficult to collect for definitive occupational therapy as part of exercise therapy because the implements are so interesting and pleasurable. The attention of the occupational therapist who guides the exercise is not regarded by the average patient in the same light as the service of a physical therapist who puts him through an exercise routine. It is probably a lack of salesmanship on the part of the doctor ordering the occupational therapy, in that he does not impress the patient with the fact that the occupational therapy is an important factor in his physical recovery. If one collects the cost of materials used by the patient, one often does well. If finished products are sold at an occupational therapy sale, one may find therapists devoting time to finishing products started by patients, or one may find the department becoming commercial and working on projects rather than thoughtfully treating patients. Many hospitals have rates for occupational therapy, especially to private patients. Such charges often become collection problems. Occupational therapy for physical (kinetic) restoration often complements physical therapy. The tendency to integrate these two therapies also suggests unification of charges. This takes care of certain cases, but, when occupational therapy alone is given, the patients customarily resent paying for the service. The training of an occupational therapist is expensive. These therapists are extremely well equipped tactfully to elicit cooperation from patients when necessary. However, their time should not be spent carrying out routines which nonprofessionals might well do.

In order to control this phase of the service, the hospital planning committee gave a directive to the director of the occupational and physical therapy department to weigh the needs of occupational therapy requisitions and implement only those which seemed rational. The physiatrists and several occupational therapists discussed the best manner of carrying out this directive. It was decided that education of the hospital staff was the key to the problem. The fact is that it is impossible to sit down with the attending, resident and nursing staff and drill the rationale of occupational therapy into them. It was determined that the best way to accomplish our end was to introduce a form designed for the use of the physician ordering occupational therapy. This form was so arranged that it would force the attending physician, surgeon, neurologist, or whatever his relation to the patient, to devote a little thought to the purpose of the occuptional therapy he was ordering. When properly filled out, the form supplied all the information the occupational therapist needed properly to care for the patient. Diagnosis, objective of treatment, age of patient, physical and mental limitations, estimated length of hospital stay, and other pertinent data were included among the questions to be answered. To clinch the matter, at the end of the form the question

occurs, "Is this being ordered purely to occupy the patient's time while in the hospital?" In the body of the requisition, specific needs could be stated, such as physical, mental hygiene, psychiatric, work tolerance, or prevocational determinations.

Before the form was put into use, the heads of all services of the hospital were informed of its purposes and the need for care in prescription writing, to assure better treatment of the patient and improved economy of occupational therapy service.

COLUMBIA PRESBYTERIAN MEDICAL CENTER

PRESCRIPTION FOR OCCUPATIONAL THERAPY

Ward or Room ____ Clinic ____ Date ____

Name ____ Age ____ Sex ____ Occupation ____ Unit No. ____

Diagnosis ____ Expected Hospitalization ____

Bed ____ Shop ____ hours per day. ____ days per week

PRECAUTIONARY INFORMATION:

Activity: Unlimited ____, Within limits of: Pain ____, Fatigue ____

Position: Lying ____, Sitting ____, Standing ____, Free Ambulation ____

Eyesight: Deficient ____, Blind ____, Field Defects ____, One Eye ____, Both Eyes ____

Seizures: Yes ____, No ____ If Yes, Type ____ Frequency ____
Aura: Yes ____, No ____

Orthopedic: May braces or other appliances be removed during treatment? Yes ____, No ____
To what extent?

General: Sensory Loss ____, Cardiac ____, T.B. ____, Diabetes ____
Suicidal ____, Aseptic Precautions ____

Any Other Precautions: ____

SPECIFIC DISABILITY: ____

PURPOSE OF TREATMENT:

Physical

____ Increase Range of Motion
____ Increase Muscle Strength
____ Improve Coordination
____ Visual Manual Dexterity
____ Increase Work Capacity
____ Determine Handedness

Activities of Daily Living

____ Self-help
____ Writing: Right ____, Left ____
____ Braille
____ Touch Typing

Pre-Vocational Exploration

____ Interests
____ Aptitudes
____ Concentration
____ Speed
____ Manual Skill

Part to be treated:

Right	Upper Extremity	Left
____	Shoulder	____
____	Elbow	____
____	Wrist	____
____	Fingers	____
	Lower Extremity	
____	Hip	____
____	Knee	____
____	Ankle	____
	Back	

Psychiatric: ____ **Mental Hygiene:** ____

____ Adjustment to Disability
____ Develop Motivation
____ Outlet for excess energy
____ Constructive activity
____ Stimulating activity
____ Sedative activity
____ Observe Behavior Pattern
____ Socialization

Is this being ordered purely to occupy the patient's time while in the hospital? Yes ____, No ____
If yes, are there any psychiatric implications? Yes ____, No ____

____ M.D.

The form is simple to fill out and requires about three minutes of the physician's time. It has the appearance of a questionnaire, and like all such documents met a certain degree of resistance. The staff of the occupational therapy division has persevered in pushing the use of the form. The improved treatment results achieved have broken down resistance originally encountered.

It is our opinion that if any prescription is worth writing it is certainly worth three minutes of the doctor's time in the interest of his patient. If it is not, then it is too nonspecific to be of value. Likewise, when a doctor fills out this form he is forced to think of occupational therapy as a necessity in his patient's care and will take the time to order it only when it is really indicated. So we accomplish three necessary aims: (1) elimination of unneces-

sary occupational therapy; (2) a well considered order for the occupational therapy, and (3) continuous staff education.

Unless sufficient data are supplied on the form, the occupational therapy department refuses treatment until the necessary data is supplied. When the form is complete and the indications clearly stated, the work is started. All purely diversional orders are brought to the attention of the medical director, who has the power to effect them or not, depending on the load being carried at the time and the apparent need for such diversion. These judgments are based on estimated length of hospital stay, age, disability, etc., in consultation with the ordering doctor if necessary.

A psychiatric diagnosis raises no question. Any procedure for physical restoration is always accepted unless the hospital stay will be too short and the patient unable to continue treatment as an outpatient. Needed training for activities of daily living is always accepted if time is available. Prevocational exploration is seldom requested in a hospital such as ours, with three weeks for the average hospital stay, but when requested it is always given.

The greatest problem in acceptance is in the field of mental hygiene. A line exists between occupational therapy given for mental hygiene and occupational therapy to overcome tedium. Tedium and anxiety under certain conditions must be forestalled while the patient is in the hospital if future complications are to be avoided.

Following are a few examples of the types of patients for whom requisitions passed over the director's desk and were accepted.

1. Patients with prolonged hospital stay in whom anxieties exist or threaten. Among these are patients with myocardial and pulmonary infarctions, Hodgkin's disease, lupus erythematosis disseminatus, carcinoma, diabetes with complications — especially blindness requiring adjustment — or chronic liver disease and patients undergoing plastic surgery.
2. Obstetrical patients with hyperemesis gravidarum, early rupture of membranes, threatened abortion and anxiety.
3. Young boys in men's wards with such diagnosis as diabetes, acute multiple sclerosis, rheumatic fever, etc., in need of mental hygiene.
4. Patients with psychosomatic symptoms in whom motivation is lacking or drives excessive.
5. Patients with grave diagnoses and anxiety; short term patients with laryngectomy for carcinoma with loss of voice and anxiety; patients with rheumatic fever.

It may be that these patients could have been treated without occupational therapy but it is our opinion that they do better with it.

As bases for positive rejections, the two most recurrent are (1) improperly completed forms, in which no definite indications of need is supplied, and (2) short term hospital stay unless there is a frank psychiatric condition or need for physical rehabilitation.

A summary of the first six months of 1950 at Presbyterian Hospital is as follows:

Number of requisitions for occupational therapy received	126	
Number of requisitions rejected	17	(13.5 per cent)
Of the remaining	109	
Physical restoration	10	(8.3 per cent)
Mental hygiene	44	(40 per cent)
Diversion	55	(51 per cent)
Strong load for diversional therapy — approximately	50	per cent
Prophylactic mental hygiene — approximately	40	per cent
Kinetic — approximately	10	per cent

It should be noted (1) that patients with neurological diagnoses are admitted to the Neurological Institute of the Columbia Presbyterian Medical Center, and (2) no diversional occupational therapy is given in the outpatient department of Vanderbilt Clinic.

It is interesting to compare these figures with those of the Neurological Institute, where many patients with functional neuroses and central nervous system disease are admitted and where an extremely active neurosurgical service exists.

Total number of requistions	101 (in six months)
Rejected	15 (14.5 per cent)
Of the remaining	86
Of the remaining 86 —	
Physical restoration	41 (49 per cent)
Psychiatric help	24 (27 per cent)
Mental hygiene	15 (17 per cent)
Diversion	6 (7 per cent)
Strong load divided approximately — Kinetic occupational therapy	—50 per cent
Neuropsychiatric	—40 per cent
Diversion	—10 per cent

The figures for Vanderbilt Clinic outpatient department are as follows:

Total number of requisitions	18
Kinetic (physical restoration)	15 (83 per cent)
Mental hygiene	3 (17 per cent)
Diversion	0

The totals of all requisitions for occupational therapy at the Columbia Presbyterian Medical Center, excluding highly specialized occupational therapy at the Institute for Ophthalmology, are as follows: total requisitions, 245; total rejections, 32 (13 per cent). Of the remaining 213 requisitions 66 (30.9 per cent) were for physical restoration; 24 (11.6 per cent), for psychiatric reasons; 62 (29.0 per cent), for mental hygiene, and 61 (28.5 per cent), for diversion.

Roughly, the total occupational therapy demands are —30 per cent for physical restoration; 10 per cent for psychiatric reasons; 30 per cent for mental hygiene and 30 per cent for diversion.

How do these figures affect the future economies of the occupational therapy department at the Medical Center?

Well trained occupational therapists are definitely needed to cover the 10 per cent psychiatric and the 30 per cent physical restoration work. Professional occupational therapy direction will be required for at least 10 per cent of the mental hygiene needs. This totals 50 per cent of the service needs.

We are exploring the possibility of using less fully trained workers and the question of need for recreation of the other 50 per cent of mental hygiene and diversional patients. This remains an incompleted part of our problem. Whether this will be done through the difficult medium of volunteer workers under occupational therapy supervision or whether the hospital authorities will eliminate all the diversional activity by occupational therapists, remains for future determination.

As a result of the use of this form, 13 per cent, or one eighth, of the occupational therapy service has been curtailed. This has made it possible to eliminate two members of the personnel in the department, with a consequent improved wage scale for the remaining staff. Occupational therapy professionals still do diversional work. If others are employed to cover this need, or if diversional occupational therapy is eliminated, further economy will be effected. The morale of the occupational therapy department has been considerably bolstered as a result of this study.

Conclusions

1. The practice of occupational therapy in an acute general hospital differs greatly from that of psychiatric, tuberculosis or rehabilitation centers or chronic institutions.

2. Occupational therapy service supplied in a general hospital is costly, and it is difficult to recover this cost.

3. Too free availability of occupational therapy in any hospital without control against possible abuses represents poor economy.

4. Hospital staff education regarding occupational therapy uses and abuses is needed.

5. A form adequate to control occupational therapy is here presented, along with suggestions for its effective utilization.

6. A suggestion is made that other than trained professional occupational therapists be employed to carry the apparent indicated needs for mental diversion and elimination of tedium of certain patients during their hospitalization.

7. In the reorganization of the occupational therapy department there has been a relative increase in kinetic occupational therapy of 10 per cent.

8. As a result of the study herewith presented, the occupational therapy department has gained prestige within the hospital and the status of the individual workers has been improved.

ELECTROMYOGRAPHY *

I. A Portable Electromyograph for Clinical and Research Purposes

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Electromyography is a branch of medical science which deals with the eliciting, indicating, recording and evaluating of voltages produced within skeletal muscle. Since the techniques of electromyography are not well standardized, there are several currently used methods of performing each of the primary functions. Among the several variants of these, there are certain optimum ways which will enable one to do the most accurate and informative work. These preferred ways of picking up, amplifying and indicating or recording the muscle voltages have been incorporated into an electromyograph which has been designed and built for the Veterans Administration Hospital at Hines, Ill., and a brief description of this piece of apparatus will be offered in this paper.

A wide selection of methods is available for picking up the voltages from a muscle which is being studied. In common practice three electrodes are used; one is grounded, while each one of the other two is connected to its respective grid in the input stage of an electronic amplifier. These two elec-

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trodes are applied either percutaneously or intramuscularly, and sometimes one is used percutaneously while the other is applied intramuscularly. The latter way is a favored compromise.

The intramuscular electrode is sometimes a monopolar needle, or it may be one of the types of concentric needles. Because of its simplicity, reliability, reproductibility and minimum traumatizing action, the monopolar needle is preferred. Surface electrodes have been used in greater variety, their list including E.E.G. electrodes, E.K.G. electrodes, phosphor bronze or copper foil, copper screen, saline-soaked pads and small mounds of conductive adhesive clay. The kind chosen should be easy to apply to the area being studied and should maintain for the duration of the examination a uniformly low value of contact resistance.

There are good and valid reasons for the fact that type and placement of electrodes do influence the form and magnitude of the observed voltage waves. One can readily appreciate this when he visualizes the voltages being generated within the muscle tissue and then being shunted by the quasi resistance-capacitance networks of the overlying fascia. Certainly the higher frequency components of the original wave are strongly attenuated by the time they have passed through the epidermis. Actually, there are other reasons for the change in the wave shape, but a full discussion of waveform distortion was not contemplated in this paper. From the above, it should be clear that the great variety of methods used in picking up the muscle voltages makes comparison of results among various workers a little difficult.

Up to the present time investigators in this field have employed string galvanometers, electrocardiographs, electroencephalographs and suitable custom-built amplifiers with various indicators which were capable of making the amplified voltage variations audible and also visible. In the latter class of indicators, there are those which allow the investigator to observe the voltage variations just at the time they occur or those which allow him to get a permanent record.

Some of the common methods of producing a permanent record consist of (1) recording with a light-beam galvanometer on photographic film or paper; (2) tracing on chart paper with some form of pen-writer; (3) photographing the trace on a cathode ray tube, and (4) recording the voltage variations on wire or magnetic tape for future play-back. Each of these methods has its effect on the final record and can supply its own peculiar artifacts, but the third method is inherently capable of performing with the greatest fidelity.

To photograph the screen of a cathode ray tube, there are three common ways, each one of which has some good and some undesirable features. The ordinary "still" camera is cheaply operated, can obtain a large image, but misses most of the electrical activity. The ordinary movie camera costs more to operate, gets a small image, but catches most of the activity and provides a means of demonstrating electromyographic phenomena to a large audience at a later time. Of course, this method can use a sound track with all that it implies. The continuous strip film camera costs most to operate, but it is the only method that provides a continuous record of the voltage variations just as they occurred. It usually produces a rather small image, but its time base is independent of the time base in the electromyograph and can be made to "spread out" waves of short duration. This method does not ordinarily allow the therapist to observe the waves at the time that they are being recorded.

Even though electromyography is currently being used by many investigators, there is not complete unanimity of opinion as to what constitutes an accurate description of a normal motor unit voltage wave. A reading of the literature reveals a rather large range for almost any of the characteristics which are subject to measurement. When one recalls the variety of apparatus and techniques being used, this situation becomes understandable, but it also suggests that at some time there should be a meeting of the interested research workers in this field to decide upon a set of standards which would be published as a guide for those doing clinical work.

A series of conferences among the responsible neurologists and physiatrists at the Veterans Administration Hospital at Hines, Ill., resulted in the design of an electromyograph having the following features:

1. Operation from the 115 volt A.C. line without need for shielded room.
2. Five inch cathode ray tube.
3. Loudspeaker with independent volume control.
4. Built-in calibrator.
5. Continuously recurrent sweep.
6. Triggered sweep for use with "still" camera.
7. Calibration facility for duration of sweep.
8. Noise level in unshielded room of 5 microvolts peak.
9. Gain such that the following voltage values (expressed in peak microvolts) would cause a 2 inch peak-to-peak deflection of the cathode ray beam: 50, 100, 500, 1,000, 2,500 and 5,000.
10. Provision for securing mounting a 16 mm. moving picture camera at an appropriate distance in front of the cathode ray tube.
11. Bell & Howell *Filmo* "Speedster" camera with f/1.5 lens and an Eastman no. 2, "Portra" lens.

A general view of the whole electromyograph with the movie camera attached is shown in figure 1. The sturdy camera mounting frame is easily

Fig. 1. — Camera mounted to record electromyograms.

unhooked and removed without tools. A "still" camera can be mounted on the same frame and can be connected to "trigger" the sweep circuit by inserting a suitable plug into the receptacle near the middle of the power supply panel. On the right end of the cabinet there is a small loud speaker which enables one to hear the muscle voltages. Directly above the screen of the cathode ray tube a novel "slide-rule" type of titler (described in the second part of this article) is mounted so that every frame of the film is identified in all important respects (fig. 2).

Of unusual interest in the list of features is the calibrator. This is a stabilized 100 cycle oscillator which provides a balanced differential signal of measured amplitude for the calibration of both gain and sweep duration. Measurement of the input signal is made by a specially designed A.C. voltmeter having three ranges calibrated in peak microvolts on a sine wave. These ranges are coordinated with the sensitivity ranges so that checking and adjusting the over-all amplification of the system on any range is done in a few seconds.

This calibrator was an unusual refinement in commercial electromyographs because of its high accuracy, its ease of manipulation and the employment of a higher frequency (than 60 cycles), which allows calibration of the sweep duration in a decimal system of milliseconds.

The sweep generator could be synchronized with the calibration oscillator when that was desired. It could also be synchronized with the line frequency or it could be triggered manually or be left free running. All controls for it are located on the power supply panel, as is shown in figure 2. In ordinary use, sweep operation is continuously recurrent without loss of time off the screen. Because of this fact, all the voltage waves are portrayed on the screen. This is especially important on the intermittent types of waves such as isolated fibrillary spikes and reinnervating muscle voltages.

The preamplifier, which was the limiting element in the amplifying system so far as high frequency was concerned, was down 2 db. at 2,000 cycles from its value at 100 cycles. Its response was flat from 50 cycles to 1,000 cycles and was down less than ½ db. at 20 cycles. Since the vertical am-

Fig. 2. — Specially designed electromyograph.

plifier and cathode ray tube were direct-coupled, they had no frequency limitations within these ranges.

Reference to figure 2 shows the functional grouping of the controls. All controls relating to the function of amplification are on the preamplifier panel, while those pertaining to the cathode ray tube only are on its panel. This design reduces the probability of errors in operating the apparatus.

Electrode size and placement were chosen to permit simple application and uniform results. A typical grouping with respect to one of the intrinsic muscles of the hand is shown in figure 3. The ground electrode is a part of

the cable termination, but the other two electrodes are the active ones. In the interest of avoiding the pick-up of extraneous signals, the two active electrodes should be placed close together. While the needle could be connected to either pin-jack, it is actually connected to a particular one each time in order to maintain the same relation between voltage polarity and tube deflection. It is customary in this work to find that an upward motion of the beam on the cathode ray tube indicates that the needle has become electronegative with respect to the other electrode. A sample of an electromyogram from 16 mm. movies can be seen in figure 4.

In summary, this paper has outlined some of the desiderata of a portable electromyograph which is suitable for clinical and research purposes. It has also described the electromyograph[1] which was designed to meet these require-

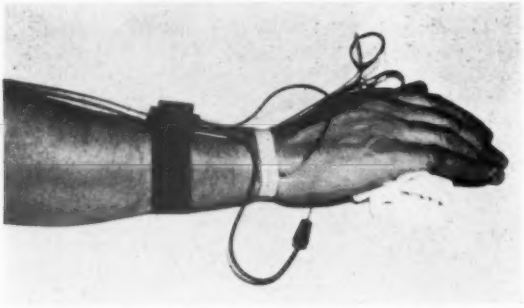

Fig. 3. — Electrode assembly for testing the abductor digiti quinti muscle.

ments. Among its unique features, not regularly found, are the accurate built-in calibrator, the versatile sweep circuit, the provision for calibrating duration of sweep, the wide range of sensitivity, and the use of a 16 mm. moving picture camera for photographing and titling each oscillogram.

In addition to these features, the instrument operates from the 115 A.C. line without the need for a shielded room; it contains a 5 in. cathode ray tube and a loud speaker that has an independent volume control.

We are greatly indebted to the physical therapists at the hospital, especially Miss Edna Dillon and Miss Jeanette Neckar, for their assistance, and to the Medical Illustration Laboratory for the photographs.

II. Sixteen Millimeter Motion Pictures and a Means of Titling for Continuous Oscillographic Recording in Electromyography

The problem of recording satisfactorily voltage variations which are observed in connection with various biological and biochemical processes is one that has no single and final answer. The end result of a recording is a graph usually, but not necessarily, having as its independent variable time measured in convenient units such as hours, minutes, seconds or milliseconds. We emphasize the units because they have a profound bearing on the choice of recording mechanism.

1. This electromyograph was constructed by the Chicago Medical Electronics Laboratory, Inc., Chicago, Ill.

The dependent variable may be microvolts or millivolts as referred to the input of the amplifying apparatus. It may also be some associated proportional quantity such as force or displacement. Undoubtedly most of us are accustomed to thinking in terms of microvolts; hence this is the term that will be used in this paper. Characteristics of the dependent variable that influence the choice of recording method are speed with which the voltage changes occur, the frequency components within the voltage wave, the duration of the longest voltage wave and the maximum duration of a recording period. In addition, it is well to remember that such properties as dependability, ease of manipulation and expense of operation are so important that they may become the decisive ones.

Each problem has to be decided from a consideration of its own requirements and its associated restricting conditions.

The problem which confronted the investigators at the Veterans Administration Hospital at Hines, Ill., was one of obtaining a large number of representative tracings of the voltage waves that were being developed by the muscles being tested in patients with peripheral nerve injuries, spinal cord injuries or muscular dystrophies. Since these examinations were made regularly on numerous patients and on still more numerous muscles, the matter of identifying all the records completely and accurately was an important part of the problem.

Muscle voltages change very rapidly, and the individual waves are only a few milliseconds in length. For these reasons, a cathode ray tube was the only device rapid enough to trace an accurate graph of these voltage waves. The actual apparatus used was a newly built electromyograph, which is shown in figure 2.

This electromyograph is a device especially designed to pick up muscle voltages and to reproduce them visibly on a cathode ray tube and audibly in a loudspeaker. All the controls affecting the amplification function are located on the left panel, while those associated with the power supply and sweep circuit are on the right panel. The controls affecting the brilliance and focus of the beam on the cathode ray tube are on the center panel.

The camera used to obtain the record of the waves traced on the screen of the cathode ray tube is a Bell & Howell Filmo, 16 mm., magazine-loading model having a 1.5 lens (fig. 1). It is also provided with a Kodak "Portra" lens of +1.00 D. This type of camera was chosen because of the ease of handling. There is no threading of the film to be done. This camera is mounted on a very substantial bracket that can be taken off quickly when it is not needed.

Located immediately above the screen of the cathode ray tube there is a slide-rule type of marker by means of which the therapist can identify every frame of the moving picture that is taken to accompany each examination. Figure 1 shows this titler more clearly. Here it is seen that this device, which was built in the Manual Arts Therapy Unit, Physical Medicine Rehabilitation Service, at Hines, is capable of showing all the regular settings for gain and sweep speed. It also contains a space for the name of the patient and other pertinent data. The data can be changed for other projects.

The records obtained by the use of this apparatus can be used in two different ways. When the developed film is projected on a screen, the ob-

server sees just the same sequences of waves as were portrayed on the cathode ray tube during the examination. Only the sound is missing. For more detailed study of individual waves, enlargements of chosen frames are sometimes made, as shown in figure 4. It will be noticed that the frame carries its identification.

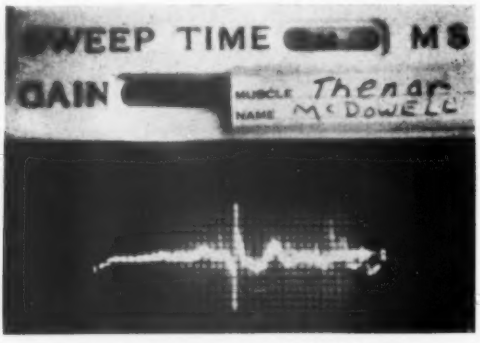

Fig. 4. — Enlargement of an individual frame.

In summary, a standard 16 mm. moving picture camera, having the magazine-loading feature has been adapted to the purpose of getting vast numbers of completely identified permanent records.

We are indebted to the Medical Illustration Laboratory, Veterans Administration Hospital, Hines, Illinois, for the photographs.

THE MEASUREMENT OF PHYSICAL FITNESS AS A PROBLEM IN PHYSICAL MEDICINE *

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This paper summarizes an extended series of experiments begun at Northwestern University during wartime, carried out with the aid of many colleagues and volunteer subjects, and reported from time to time in brief papers.[1] These experiments were undertaken with certain immediate objects in view. An accelerated program of study was in effect in the medical schools, and it was desirable to know whether it was affecting the health and attitudes of the students. In addition to the answers to these immediate questions, however, the study yielded other conclusions of interest and throws light on certain problems confronting physical medicine today.

A preliminary study was made to see whether attendance on summer sessions of the medical school in prewar years (when attendance had been voluntary) had affected health or scholarship. Health was measured provisionally by counting the number of each student's visits to the student health officer, and scholarship was measured by grades recorded in the registrar's office. No effect was found. While both of the methods used for quantitating health and scholarship were open to criticism, it seemed reasonable to conclude that students who needed to recuperate mentally or physically during the summer did so. As long as they were free to adjust in this way, any statistical differences that might have existed at the end of the spring quarter were erased before the students returned in the autumn.

This raised the question as to what might be the effect when attendance through the summer was compulsory for all. At the same time it was evident that better measures of a student's general health were needed, and a variety of tests for physical fitness were considered. The following were actually tried: body-weight (with due regard to height and age), the Flack test, the percentage of lymphocytes in the differential blood count, the sedimentation rate, the hematocrit (cell-pack) reading, the basal metabolic rate (BMR), and the blood cholesterol.

Working with these tests day after day opened our eyes to the many possibilities of error and to the need of testing the tests themselves. Most of these tests were thereupon studied critically by the test-retest correlation method, and it was also possible to compare them with respect to time required, expense, and convenience and with respect to the amount of preparation needed to standardize conditions. The most impressive facts that came out of these observations related to the basal metabolic rate.

An elaborate ritual was developed for standardizing the conditions of the students for the BMR determinations. The subjects ate a standard sup-

* Read at the Twenty-Eighth Annual Session of the American Congress of Physical Medicine, Boston, Aug. 29, 1950.

1. Jung, F. T., and Cisler, L. E.: A Study of Staleness in Students, Quart. Bull. Northwestern Univ. M. School **19**:32-36, 1945. Jung, F. T.; Cisler, L. E., and Maynard, M. S.: The Relation of the Basal Metabolic Rate in Students to the Results of Various Tests for Physical Fitness and Mental Staleness, ibid, **20**:336-339, 1945. Jung, F. T., and Cisler, L. E.: The Relation of a Measurement of Enthusiasm-Staleness in Medical Students to Measurements of Physical Fitness, ibid, **21**:157-161, 1947. Jung, F. T.; Cisler, L. E., and Miller, V. C.: Certain Factors Affecting the Cardiac Recovery Index of Medical Students, Federation Proc. **5**:53, 1946.

per the evening before the test and spent the night in a hospital. In spite of these and innumerable other precautions, the test-retest correlation for BMR's came out 0.27, a figure so low that in any other field but medicine a test so unreliable would be discarded at once as a waste of time. Moreover, the figures obtained averaged 6% below normal as determined from tables in common use. This agreed with the experience of other investigators and was interpreted as implying either that the tables were wrong or that medical students differed from the rest of the male population. If the latter were true, the difference ought to be more marked in the older students and imperceptible in the youngest. It turned out that the discrepancy was about the same for freshmen as for juniors, and the conclusions were that the tables were unsatisfactory.

When the BMR was compared with other measurements made in efforts to assess physical fitness, no significant correlation was found with the pulse rate or the sedimentation rate, but suggestions of correlation were found with the Flack test score, the lymphocyte count, and the hematocrit (cell-pack) reading. It appeared that fitness within this range was related to low sedimentation rate, low Flack score, high hematocrit reading, and low BMR.

Next there was developed an enthusiasm-staleness score by means of an attitude-scale developed especially for the purpose. This test was proved to have a high self-correlation and to afford a fairly consistent measure of the mental state it was intended to quantitate. It was also positively correlated both with the student's aptitude rating and with his scholarship record, but not with any of the measures of physical fitness. In fact, we found our data in agreement with the general impression that scholarly persons are inclined to slight their physical needs.

Finally, there was developed a test for cardiovascular efficiency very similar to the Harvard step test. It differed from the Harvard test in that the step-ups were only half as fast; consequently every one of our subjects (with an exception only on one occasion) was always able to complete the prescribed exercise. Thus no question arose as to the theoretical correctness of grading uncompleted exercise. We called the resulting score the "cardiac recovery index" because it depended on the promptness with which the subject's heart returned to its initial rate after the temporary acceleration caused by the exercise.

Our experience with this cardiac recovery index was gratifying, and the results were valuable. The test-retest correlations were high; the procedure was quick, convenient, and agreeable to the participants; the factor of motivation was insignificant, and no expensive apparatus was needed. There was one weakness in this test that fortunately did not affect our group of subjects: It was close to the limit of their endurance and would have been too strenuous for people a little older or even slightly handicapped by illness. On the one occasion referred to, it proved too strenuous for one student who was not feeling well. In short, if we had wished to extend the range of our observations to include others besides the youthful and able-bodied group of subjects we happened to have, the test could not have been used without drastic modification.

When this test was repeated after an interval of seven days, though the self-correlation was high, there was also a rise in the average score for the whole group. This was assumed to be a practice effect. We did not undertake the additional experiments that might have told us whether this practice effect would be as troublesome on frequent repetitions of the test as

is the training effect, for instance, in bicycle ergometry. The index also rose during an interval of 40 days that included a vacation. The rise was significant, and accompanied by a significant rise in the enthusiasm-staleness score. An interesting paradox was observed here. Although the students improved in both physical fitness and mental attitude as a group, there was no correlation between the behavior of the two scores in a given student; that is, in a student in whom one quantity went up during the vacation, the other quantity was just as likely to go down as to go up.

Summarizing the immediate results of this study we should say that (*a*) of the several tests for physical fitness that were tried, the one that seemed most satisfactory as applied to our particular group of subjects was the cardiac recovery index, a modification of the Harvard step test; (*b*) it was also possible to get a rather reliable indication or measure of a student's enthusiasm for his work by the use of an attitude scale that was developed for the purpose; (*c*) both physical fitness and enthusiasm declined measurably during long uninterrupted periods of schooling, and both rose significantly during an interval that included a vacation; (*d*) there was no positive correlation between enthusiasm and fitness in this group, and there were even suggestions of a negative correlation; (*e*) basal metabolic rate determinations were unreliable in the technical sense, even when done with extraordinary care on unafraid and cooperative young adults, and were useless as an index of fitness within the normal range; moreover, the standards in general use were in error to the extent of about 6% when applied to these medical students.

A sixth observation of considerable interest emerged from a study of the data on height: The younger half of the freshman class were 3.4 cm. shorter in stature than were the older half. This simple fact leads to the significant conclusion that students entering the medical schools are not yet full grown, and so hygienic measures to insure the attainment of their full stature while they are in school deserve serious consideration. This fact alone would have justified the studies I have been describing.

While these data, then, have much intrinsic interest, they are presented here for the additional reason that they exemplify certain principles of real concern in the development of physical medicine.

1. It is hard to define "fitness" in a way that does not make it a synonym for "normalness." The familiar question "Fit for what?" is exactly paralleled in the question, "Normal in what respect?" If the restoration of a person to a normal state is the object of physical medicine, then clearly the further development of criteria of physical fitness is one of the prerequisites for continued progress in physical medicine.

2. Existing measurements of over-all fitness need to be extended so that they can be applied to people of all ages and even to patients in bed. The largest masses of data on fitness assembled so far are those of the armed forces, and they relate to young men at the peak of physical development. Another large collection of figures is that of Collumbine and his associates[2]; they report on about 7,000 Ceylonese subjects, none of them over 40 years of age. It clearly will not do to have one test for the young and another for the old, one for the athletic and another for the asthenic.

3. This brings up another principle which must be recognized as a serious criticism of the original experiments I have described. If one wishes to make good regression curves and to obtain convincing correlation coefficients (rather than suggestions of trends), one must not only have many more

2. Collumbine, H.; Bibile, S. W.; Wikramanayake, T. W., and Watson, R. S.: Influence of Age, Sex, Physique and Muscular Development on Physical Fitness, J. Applied Physiol. 2:488-511, 1950.

subjects than were used in these experiments but should also let the variables move over as wide a range as possible. The same extreme cases that are a problem in computing averages because one wonders whether they should not be excluded as altogether atypical may be helpful and significant when one is computing correlations because they may so clearly suggest the nature of the relationship one is seeking. Within a limited range, the relation between two variables may be practically linear or they may even be practically proportional. This fact has led to the use of simple quotients in making up various indexes. The fallacy involved in this process is now well known to statisticians, and it is but one example of the wrong conclusions that have been drawn from data obtained within too narrow a range.

An example is a recent observation[2] in a group of adult men that those with the broader hips had a high mechanical efficiency in moderate work. Within the range studied that was undeniably true. But what if the study had been extended to include men with exceptionally broad hips? The straight regression line would inevitably turn out to be a curve with a maximum, and it is very likely indeed that beyond the maximum the curve would fall very steeply because excessively broad hips would be so severe a handicap to performance. It is clear that for the complete understanding of the variable being considered, and specially for the locating of optimal measurements, it is necessary to have tests that will apply to a wide range of subjects.

4. An example of a test that could be applied to most ages and conditions of man is the Flack test. It consists essentially of a series of pulse counts made while the subject maintains a prescribed intrathoracic pressure. He does this by blowing into a manometer system. This procedure is capable of many variations, all of which should be systematically studied.

Even when the procedure is carried out as described by Flack, there are still many possible ways of scoring the results. As the test was done in the present instance, a set of seven figures was obtained at each session. These could be combined in many different ways (addition, multiplication, weighting, etc.) to give scores, and the different ways are by no means equally good. A single set of test-retest figures from the Flack procedure were scored in three different ways. One method of scoring gave $r = +0.04$; another gave $r = +0.56$; and third gave $r = +0.89$. Thus the procedure appeared worthless when the results were scored in one way and were shown to have great promise when scored in another way.

Evidently the calculation of test-retest correlations not only helps one to recognize a good test but also helps one to make improvements in the execution and scoring of the test. It can be used to show, for instance, the loss in accuracy of blood pressure readings made by the auscultatory method in noisy rooms. It could be applied to the improvement, for instance, of breath-holding tests recently proposed.

5. The basal metabolic rate is entangled in a perfect mare's nest of sources of error. Nobody does direct calorimetry for purposes of clinical diagnosis at present; the caloric output is estimated indirectly by measuring the rate of oxygen consumption. It has been seriously proposed that this be replaced in turn by the use of a formula involving simply the heart rate, the diastolic pressure, and the systolic pressure, making the result not merely a secondhand but a thirdhand datum. The fact that determinations of systolic pressure are especially liable to error makes this situation even more preposterous. Many tables for the normal rate of oxygen consumption are based on a surface-area formula which probably fits the average data very well, though few physiologists would be prepared to say how accurately

this formula will estimate the surface area of any single individual. The tables are certainly wrong when applied to young men, and they lead into a paradox when applied to exceptionally tall or obese subjects. This confusion is only concealed, not cleared up, by the use of metabolimeters so fitted with strange appurtenances, hidden gadgets, and lightning calculators, that the user can neither see how the machinery is working nor discover the assumptions that underlie the calculations. Recent critical studies indicate that more reliable methods than the basal metabolic rate will soon be available for the diagnosis of thyroid disease — direct methods whose reliability can be tested readily by the test-retest method. It is to be hoped that they will also be less expensive and time-consuming.

6. There should be a variety of fitness tests, not all of them directed at the cardiovascular system. Certainly they should not all be biased in favor of the muscular individual. Many men who are asthenic in appearance all their lives survive somehow into the seventies, and some frail-looking women have children and grandchildren and live to be 80 or 90. In spite of the monumental contributions already made to the subject of longevity, one must hope that there will be further good work in this field. For instance, such tests as the cold pressor test should be used in long-term studies of the subsequent health records of the subjects.

7. Measurements of vital capacity have fallen temporarily into desuetude. The reason for this can be seen by reading Dawson's excellent chapter[3] on tests. He describes a number of indexes based on vital capacity and tells of the mathematical flourishes with which some of them were introduced. In the case of vital capacity it appears that some investigators succeeded in confusing themselves. More recent work has shown that in its place the measurement of vital capacity can yield priceless information. That is partly because it can be applied to many sick and aged subjects. It can be used, for example, to obtain a series of readings showing the progress of patients with pleural effusions, pulmonary edema, and pulmonary congestion. The difficulty in the past has been the cumbersome nature of the apparatus needed — namely, the conventional type of spirometer. The bellows-type so much used during the past war was much more convenient. Recently the Council on Physical Medicine and Rehabilitation of the American Medical Association has accepted an even smaller device, a pocket-size spirometer in which the measurements are made with the help of an almost inertialess rotor. With this instrument daily measurements on patients confined to hospital beds are extremely convenient, duplicate readings involve no extra trouble, and in the light of accumulating experience with diagnostic tests it would be possible to score and interpret the data in a way that would lead to reliable conclusions.

8. Dawson gave a significant account of the history of Pignet's formula, $P = H - (W + C)$, where H is the height in centimeters, W is the weight in kilograms, and C is the chest girth in centimeters. This index gave values from about 10 (very strong men) to about 35 (very weak, and useless for the Army). It was considered at one time of incalculable value in the Roumanian army, but at the University of Wisconsin it was found to correlate very poorly with the results of strength and motor efficiency tests. From this it was concluded that this test was useless as far as Wisconsin men and women were concerned. It was supposed that the explanation must lie in some difference between the French and the American physique. There is, however, an important alternative not mentioned by Dawson. When the

3. Dawson, P.: Physiology in Physical Education, Baltimore, The Williams & Wilkins Co., 1940.

correlation between two tests is zero, which test is one to consider worthless? Possibly each is good for its purpose, and the most immediate conclusion is that the two tests are probably measuring two different things. A test cannot be discarded because it does not give the same results as some other test. This is especially true if the thing being measured is ill-defined and inaccessible to direct measurement, as is this thing called "fitness." As a matter of fact, when two tests are so perfectly correlated that one may be substituted for the other, then one may be discarded as superfluous and one is justified in retaining whichever is the more convenient.

9. Breath-holding tests seem very promising in spite of the fact that some of the clinical work reported does not include an estimate of the reliability of the results. These tests can assume a variety of forms, some depending on intricate biochemical determinations, others on simple physical procedures. For instance, Friedemann and others have found that the deconditioning associated with enforced bed rest can be demonstrated by a rise in the ratio of lactic acid to pyruvic acid in the blood. Ray and his colleagues have developed a test for fitness on the basis of the reduction time of oxyhemoglobin in the cutaneous capillaries before and after breath holding and have correlated this with other manifestations of physiological health. The biochemical procedures require expensive apparatus and skilful technicians. Much would be gained by developing physical procedures using simpler apparatus.

10. It is probably not well known that the words "reliability" and "validity" have taken on some very special meanings in the literature relating to tests. There are many situations in which the thing to be determined by a given test is a well-defined entity that can be isolated, handled, added in known amounts, or measured directly by chemical separation. An example is the determination of glucose in body fluids. One can add weighed amounts of glucose and analyze for it by the new method, and by comparing the actual with the expected results one obtains a statistical quantity called the "index of validity." The word "validity" is now reserved for those situations in which one is testing by indirect (presumably more convenient) methods for something that can also be determined by a direct (presumably less convenient) method.

Now in medicine there occur many situations in which the thing to be tested is ill-defined (as is "fitness," for example), cannot be isolated, cannot be added to the situation in known amounts, and cannot, perhaps, even be estimated by other known methods. A psychologist, for instance, cannot estimate the goodness of a new test for memory by endowing a person with increasing, measured amounts of memory. In fact, there are situations in which the test process itself is a definition of the thing being tested for. This is true even in physics, and it has led physicists to emphasize the importance of "operational analysis." Like the psychologist and the physiologist, the physicist is obliged to report, "We did the experiment as we did it, and we got the results we got." It will be necessary for medicine to develop many tests, including many that will prove disappointing. In many cases the thing being tested for will be defined by the test itself, and the goodness of the test will be determined not by comparison with the results of some other but by repetitions of the same. This leads to something called the "index of reliability," which must be distinguished from the "index of validity."

11. It is to be hoped that in addition to special diagnostic tests aimed at some particular function or organ, and in addition to fitness tests designed to estimate the over-all status of the body, there will be developed methods

of indicating the presence of strains. The body not only is able to compensate for many handicaps, but also is able to conceal the fact that an effort to compensate is being made. The result of this dissimulation often is that the strain and the compensatory effort both increase until there is not a gradual and visible weakening but a sudden collapse. In physics such strains can be demonstrated, for instance, by examining transparent models of beams and trusses by polarized light. In medicine the problem is more difficult, but it is of fundamental importance.

Summary

1. The development of accurate diagnostic tests is essential to the progress of physical medicine.

2. Existing tests need further development so as to be applicable to more inclusive groups of subjects.

3. Investigators proposing new diagnostic procedures and manufacturers introducing new forms of diagnostic apparatus should make sure that the reliability or validity (as the case may be) of the new procedure is determined by sound mathematical analysis before making enthusiastic claims for them. Dependable diagnostic methods are prerequisite to any critical evaluation of therapeutic results.

4. Tests for over-all fitness are as necessary as are tests for the functional state of single organs. Such tests, if properly refined, may yield better evidence than is now available for the subtle benefits of many forms of physical medicine such as massage and sunlight.

Discussion

Dr. Michael Dacso (New York): The main difficulty, as we have heard, in this field, is that most of the data on physical fitness are obtained from experiments performed on healthy young people e. g. athletes, college students and servicemen. For this very reason, the experimental results cannot be easily applied to conditions existing in chronically ill, elderly or handicapped people. Physical fitness, to many people, has an athletic connotation, and for this very reason I prefer to use the term„ "physical efficiency."

Obviously, physical efficiency does not depend on the functions of any individual organ or system. It cannot be expected that tests of the neuromuscular system, the cardiorespiratory system or sensory organs will yield any data that will give us sufficient information on the general over-all fitness of an individual. Not only is good physcial efficiency testing essential in evaluation of a certain stationary condition, but it is also very important in measuring quantitatively our therapeutic efficiency and it is also indispensable to good prescription writing in physical medicine.

The slight modification of the time-tested Harvard test, as suggested by Dr. Jung, is a noteworthy step toward the introduction of testing methods that can be used in subjects whose physical efficiency is necessarily lowered by old age or chronic illness.

I fully agree with Dr. Jung that the biochemical testing methods for physical efficiency require a rather elaborate laboratory setup and special skill, but I also feel that in experimental medicine, they should be continued to be used since many of these tests will not only give us a partial picture of a man's physical efficiency but will also permit a deeper insight into the intricate interaction of the various physiological functions resulting in physical efficiency or inefficiency.

Among the many interesting problems raised by Dr. Jung, the reference to the influence of strain on physical efficiency is probably the most important. Presently our attention in this field is primarily directed toward the measurement of the obvious manifestations of physical efficiency, almost completely disregarding the heavy undercurrent of strains and stresses which are so enormously important in its creation.

Certain investigators, notably Selye, succeeded in establishing a definite relationship between physical stress and certain endocrine functions. On the basis of their studies, it was ascertained that a direct relationship existed between physical stress and the function of the adrenal cortex, and, by the same token, physical stress and the elimination of the urinary 17-ketosteroids.

If and when, with the aid of such tests, we will be able to estimate accurately the physical efficiency or work tolerance of an individual (being fully aware of the fact that they are not synonymous) our physical rehabilitation activities will rest on much firmer grounds.

STRENGTH FREQUENCY CURVES IN POLIOMYELITIS AND IN PERIPHERAL NERVE INJURIES *

A Preliminary Report

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In January, 1948 the department of physical medicine and rehabilitation of the University of Illinois was given the opportunity to continue the research studies on electrical stimulation of muscles affected by poliomyelitis. Drs. Kosman, Osborne, and Ivy of Northwestern University began this work in humans after having first completed their controlled studies on male albino rats.[1]

As a part of this investigation the diagnostic significance of strength frequency testing was studied in muscles affected by poliomyelitis and also in those affected by peripheral nerve injury. Pollock, Golseth, and Arieff[2] described strength frequency curves in electrodiagnosis of experimentally produced peripheral nerve lesions in the cat in 1945. Literature on the clinical use of strength frequency curves in clinical electrodiagnosis appears to be virtually nonexistent; nearly all published papers on the use of alternating sine wave currents refer to the work of research physiologists. The following is a preliminary report on this part of the study.

Method

Strength frequency testing is performed by applying the testing electrode to the motor point of the muscle under examination and raising the intensity of the sine wave current to the point where a threshold (or liminal) contraction is obtained. The amount of current (in milliamperes) required to obtain threshold responses is determined for 12 frequencies between ¼ and 100 cycles per second. The following points on the strength frequency curve were determined: 0.25, 0.50, 0.75, 1.0, 2.5, 5.0, 10.0, 15.0, 20.0, 25.0, 50.0, and 100.0 cycles per second, respectively. These values are then charted on logarithmic graph paper with frequencies on the abscissa and strength in milliamperes on the ordinate.

The General Electric Variable Frequency Wave Generator was the source of electrical current. The apparatus is equipped with an intensity control, a frequency selector switch, a modulator switch which is used for all frequencies greater than 1 cycle per second, and two milliameters for measuring the amount of current delivered through the patient load.

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*. From the Department of Physical Medicine and Rehabilitation, University of Illinois Research and Educational Hospitals.
* Read at the Midwestern Sectional Meeting of the American Congress of Physical Medicine, Iowa City, May 11, 1950.
* With the technical assistance of Dorothy M. Iddings, B.S., R.P.T.; Ruth C. Morrisey, B. S., R.P.T., and Donna J. Thiemann, B.S., R.P.T.
* Aided by a grant from the National Foundation for Infantile Paralysis, Inc.

1. Kosman, A. J.; Osborne, S. L., and Ivy, A. C.: Muscle Studies, Arch. Phys. Med. 28:7-17 (Jan.) 1947.

2. Pollock, L. J.; Golseth, J. G., and Arieff, A. J.: Strength Frequency Curves in Electrodiagnosis of Experimentally Produced Peripheral Nerve Lesions in the Cat, Surg., Gynec. & Obst. 80:235-242 (March) 1945.

The characteristics of the testing currents are shown in figure 1. At 1 cycle per second and below, normal muscles are capable of accommodating to the slow rate of rise in the voltage of each pulse except at increased strength. When the muscle does respond, it does so at each individual pulse and a series of simple contractions are obtained corresponding to twice the sine wave frequency of the electrical current. (Provided intensity is adequate, there are two contractions per cycle because the muscle responds to both the negative and the positive phase of the sine wave. Pflüger's law is obeyed, however, and the muscle contraction obtained at the positive phase of the pulse is less vigorous than that obtained at the negative phase. If the intensity is not great enough, no contraction at all will occur during the

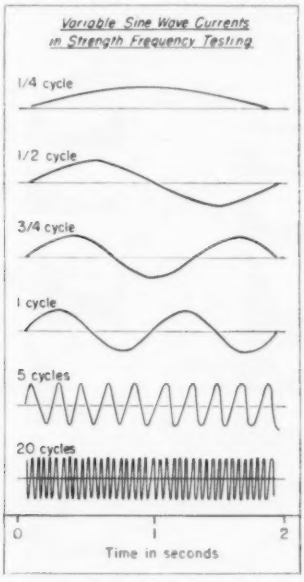


Fig. 1. — Characteristics of testing currents. The significant changes relate to differences in impulse duration and rate of rise as one proceeds from the slow to the more rapid frequencies. See text.

positive phase and then the muscle contraction frequency will correspond directly with the current frequency.)

It should be noted that as the frequency increases the duration of each pulse decreases and the rate of rise in the voltage increases. Normal muscle becomes incapable of accommodating to rapidly rising voltages, and therefore it is more easily excited to contract by the higher frequencies. Consequently, less current is required to obtain a threshold response. Furthermore, as the frequency increases, cloniclike responses (starting at 2½ cycles per second) are produced (because succeeding pulses excite the muscle at first during the relaxation phase of the preceding contraction). At 5 cycles per second succeeding pulses excite the muscle earlier in the contraction cycles with the result that a poorly fused tetanic contraction is seen. At 10 cycles per second and above, perfectly fused tetanic contractions are

obtained. The duration of each pulse becomes less and less but does not fall below the normal temporal limits of normal muscle response (chronaxie).

In denervated muscle the responses are reversed, the muscle being excited best at the lower frequencies (currents of long duration and slow rate of rise in voltage) and poorest at the higher frequencies (currents of short effective duration).

The following properties of the strength frequency curves are noted: threshold values (fig. 2, shaded area under curve), range of optimal frequencies (frequencies corresponding to the lowest milliampere values on curve), general rate of decrement of the descending limb (first portion of curve), rate of increment of the ascending limb (final portion of the curve), and general shape of the curve. In addition, the chronological sequence of changes occurring in these curves is determined for each patient tested.

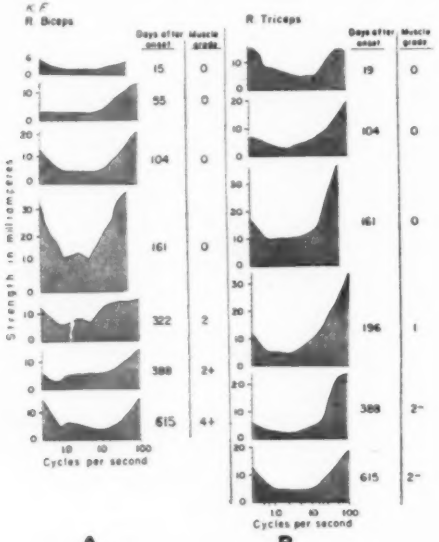


Fig. 2. — Sequence of changes occurring in strength frequency curves (*A*) in recovering right biceps and (*B*) in the right triceps. The diagnosis was partial avulsion of brachial plexus.

Results

Strength Frequency Tests in Peripheral Nerve Lesions. — Two of the cases of peripheral nerve lesions that we have observed in the past two years will be discussed in order to exemplify some of the problems encountered, as well as to serve as a basis for comparison with the results of strength frequency testing in the cases of poliomyelitis.

In the first case, that of K. F., with a diagnosis of avulsion of the brachial plexus, the sequence of changes occurring in the strength frequency curves obtained from the recovering right biceps (innervation from the fifth and sixth cervical nerve segments is of interest (fig. 2*A*). The first three curves determined between 15 and 104 days following the injury show low threshold

values, flattening of the descending limb and an increasing rate of rise in the ascending limb. However, by the 161st day the descending limb became steeper; threshold values increased to 2½ times that noted on the 104th day. On the 196th day a definite trace contraction was noted. At this time, threshold values declined appreciably and the descending limb of the curve exhibited lower threshold values. As the muscle improved in strength, the ascending limb also revealed lower thresholds and the range of optimal frequencies widened (322 to 615 days). Finally, at the time the muscle had recovered to a grade 4+, bizarre and discontinuous curves with moderately low threshold values were obtained.

The strength frequency curves obtained from triceps (innervation from the seventh and eighth cervical and possibly the first thoracic nerves) differ from those obtained from the biceps in that threshold values never rose as high as they did in the biceps and the descending limb never became so steep (fig. 2*B*). This muscle has shown a grade 2— recovery to date. No further appreciable recovery is anticipated if one considers that the distance over which regeneration must take place is approximately the same as that for the biceps. However, other unknown factors may conceivably be responsible for the delay.

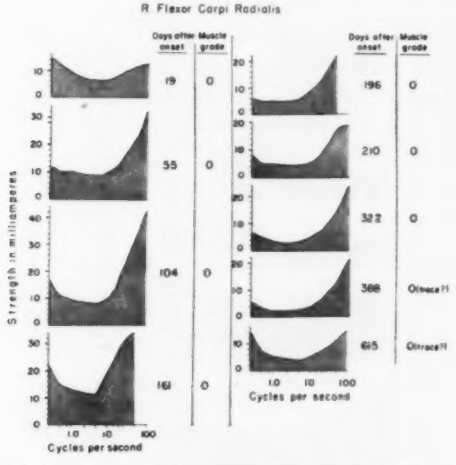


Fig. 3. — Sequence of changes occurring in strength frequency curves in the flexor carpi radialis (same patient as in Fig. 2).

In the flexor carpi radialis (fig. 3) the sequence of events is not unlike that seen in the biceps (the changes are slower in terms of days) except as might be expected from the greater distance over which regeneration must occur. For example, on the 196th day after injury the curve obtained was very similar to that found in the biceps on the 55th day. Inconstant trace contraction has been noted since the 322nd day in the flexor carpi radialis. Inasmuch as the sixth cervical innervation is considered to be a strong component of the median nerve, regeneration should be expected in approximately 24 months. If recovery does not occur, the assumption would be justified that regardless of the physical therapy program (three times a week) we were unable to maintain the morphologic, histologic, chemical, and other

necessary properties of the muscle in a sufficiently optimal state long enough for function to return, even though regeneration of the nerve might very likely have taken place. This patient is still under treatment and we shall try to continue treating him until either the full time for regeneratiion (one in a month) has elapsed or all of the muscles that have the sixth cervical nerve as a major component of innervation have shown maximal functional recovery.

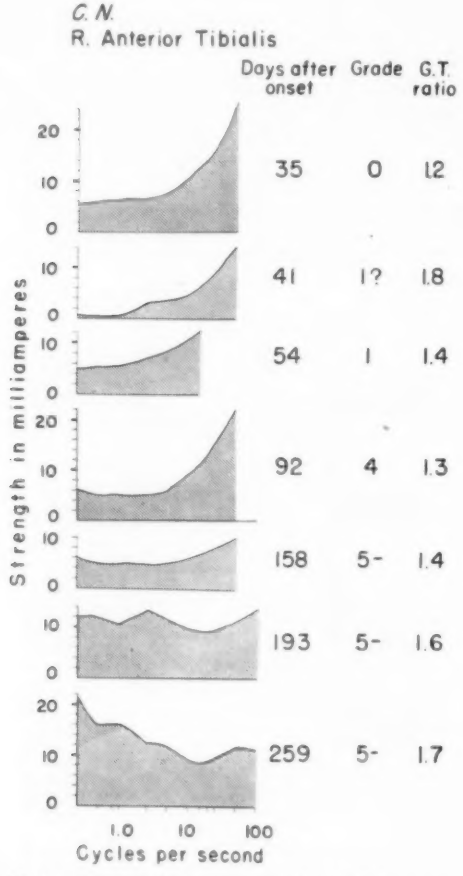


Fig. 4. — Sequence of changes occurring in strength frequency curves in right anterior tibialis of patient with traumatic injury of the right common peroneal nerve. Galvano-tetanus ratio is obtained by dividing cathodal tetanus by cathodal rheobase.

It is a fact that electrical changes do not always precede clinical changes and, in the state of our present knowledge, do not always accurately reflect the degree of regeneration. This is illustrated by the strength frequency tests obtained on the recovering right anterior tibialis of one patient (fig. 4). This patient sustained an accidental surgical injury to the right common peroneal nerve 35 days prior to his first visit to the department of physical

medicine and rehabilitation. Even after the muscle had shown a grade 4 recovery, strength frequency curves showed optimal responses in the low frequencies with relatively steep ascending limbs. Possibly, if this patient had been observed earlier, changes in the strength frequency curve might have been noted which would have added valuable information. The fact remains, however, that the strength frequency curves, so far as we can interpret them, lagged far behind clinical signs of recovery. These same observations were noted for the galvanic tetanus ratio.[3] In our experience the same electrodiagnostic findings have been noted before. This patient was tested weekly but owing to circumstances beyond our control, was unable to receive any type of physical therapy.

Strength Frequency Tests in Poliomyelitis. — It was found that the strength frequency curves obtained in these tests fell into five categories (fig. 5).

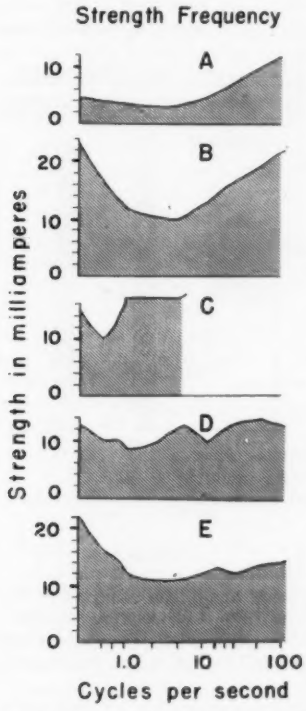


Fig. 5. — Types of strength frequency curves obtained in poliomyelitis. See text for details.

Curve *A* illustrates the first category. The descending portion is relatively flat; the thresholds of the optimal frequencies are usually low (under 10 ma.), and the ascending limb of the curve is moderately steep.

Curve *B* illustrates the second category. Here, the average optimal frequency threshold is higher than in curve *A*; the descending limb has a greater

3. Pollock, L. J.; Arieff, A. J., and Golseth, J. G.: Galvanic Tetanus and Galvanic Tetanus Ratio in Electrodiagnosis of Peripheral Nerve Lesions, Surg., Gynec. & Obst. 81:660-666 (Dec.) 1945.

rate of decrement, and the ascending limb a higher rate of increment than curve *A*, giving a modified U-shaped appearance.

Curve *C* illustrates the third category. The main characteristic of this curve is the very high threshold values. It was usually impossible to obtain the data for the entire range of frequency because the patient could not tolerate the high intensities of current required to elicit threshold contractions. This type of curve was seen most frequently in cases of muscle paralysis of very long duration.

Curve *D* illustrates the fourth category. It reveals discontinuities or has a bizarre shape. Usually there was a wider range of optimal frequencies than in curves *A*, *B*, and *C*, and the threshold values were variable.

Curve *E* illustrates the fifth category. It is characterized by variable thresholds of optimal frequencies, a descending limb of variable pitch, flattened or attenuated ascending limb and a few low caliber discontinuities. Grossly, it resembles the curve seen in normally innervated muscles.

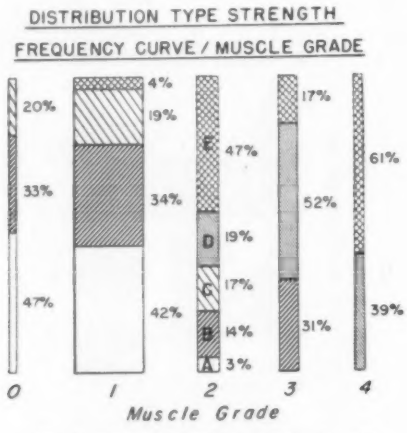


Fig. 6. — Results of 210 tests performed on 70 poliomyelitic muscles.

Comment

This preliminary report is submitted as a partial analysis of the strength frequency tests performed on muscles of poliomyelitis patients with the General Electric Variable Frequency Wave Generators. The primary objective of this study was to determine the relationship of the electrical findings and clinical changes.

Figure 6 illustrates the changing percentage of curves according to muscle grade in 210 tests performed on 70 muscles. The *A* curves were most prevalent in the 0 and grade 1 muscles and therefore may be regarded as representing the electrical response seen in degeneration. The *B* curves occurred in all but the grade 4 muscles. The *D* and *E* curves appeared to be more prevalent in recovering muscle. Arrest in change may occur at any one of the stages represented by the curves, paralleling to some degree the clinical status.

The type of curve obtained appears to depend upon the number of motor units as well as upon the predominant type of muscle fibers reinnervated.

According to Fulton,[4] a nerve or muscle contains hundreds of thousands of single units (nerve or muscle fibers) which, for one reason or another, have different thresholds of response. A stimulus which is liminal for one fiber may be subliminal for the next or submaximal for another. Therefore, if we postulate the possibility of a selective type of regeneration occurring in nerve fibers, muscle fibers, or both, we may possibly have an explanation for the type of curves described.

Like all stimuli, an effective electrical stimulus must have sufficient intensity, duration, and rate of change in its strength.[5] The ability of the nerve or muscle to be excited by the various frequencies would appear to depend upon its state of excitability as well as its ability to accommodate. These, in turn, depend upon numerous other anatomic, morphologic, chemical and pathophysiologic factors which we will make no attempt to discuss at this time.

The *A* type curve denotes a muscle that responds best to currents of relatively long duration and slow rate of change in voltage. As soon as the effective duration of the impulse falls, it becomes necessary to increase the intensity in order to obtain a threshold response. It is characteristic of denervated muscle to react to currents of longer duration and also, by virtue of its poor power to accommodation, to slowly rising currents. This same shift of the optimal frequency range to the lower frequencies (for denervated muscle) was noted by Pollock's group in their studies in the cat.[2]

In the *B* type curve the muscle responds neither to currents of long nor to currents of short duration. Thus, on the one hand, there is ability to accommodate to slowly rising, long duration currents, and, on the other hand, there is inability of the muscle to respond well to currents of short duration and greater rate of rise. The best response, accordingly, is obtained at the intermediate zone, where it is possible to excite effectively most of the available fibers. Furthermore, excitation must occur, at least in part, via nerve fibers. This is comparable to the use of progressive currents to determine the state of innervation and to detect beginning neurotization by the presence of returning accommodation.[6]

In the *C* type curve we are dealing with fibers capable of responding only to stronger stimuli. When this is found in grade 2 muscles, it may be postulated that either the fibers which regenerated were selectively those whose usual state of excitability is low or that permanent injury has left the neuromuscular apparatus in a hypoexcitable state.

In the *D* type curve the muscle may respond optimally at two or more points in the curve. Obviously, this occurs because different fibers are responding optimally to varying frequencies. This statement is based on the observed fact that different muscle fibers were actually seen to contract. For example, we have often noted that response at 1 cycle per second occurs in a different part of the muscle from that seen at 5 cycles per second. The muscle is composed of groups of fibers whose thresholds for currents of longer duration are equal to other groups of fibers that respond to currents of short duration. The fibers in each group may also be roughly equal in number or in their ability to develop tension.

Similar discontinuities are described as being characteristic of beginning innervation when the strength duration curve (stimulating with condenser

4. Howell, W. H.: Howell's Textbook of Physiology, edited by John F. Fulton and others, Philadelphia, W. B. Saunders Company, 1946, p. 19.
5. Best, C. H., and Taylor, N. B.: Physiological Basis of Medical Practice, ed. 5, Baltimore, Williams & Wilkins Company, 1949, p. 1261.
6. Pollock, L. J.; Golseth, J. G.; Arieff, A. J., and Mayfield, F. H.: Electrodiagnosis by Means of Progressive Currents of Long Duration: Studies on Peripheral Nerve Injuries in Man, Surg., Gynec. & Obst. 81:192-200 (Aug.) 1945.

shocks of varying capacity) is used. Watkins[7] felt that these discontinuities represented stimulation of fibers of different excitability, one portion being that of the denervated muscle and one that of the intramuscular nerve.

In the *E* type curve there is poor response to the low frequencies (currents of slow rate of rise and of long duration), but relatively optimal response at the higher frequencies. In a grade 4 muscle we might readily postulate that sufficient innervated fibers responding at these higher frequencies are present to give this response. In grade 2 muscles we would have to assume, however, that a selective reinnervation of those fibers responding best at the higher frequencies has occurred. The explanation for the occurence of the *E* curve in both a grade 2 and a grade 4 muscle would have to be based on the differences in the total number of such fibers reinnervated. In general, the results obtained are comparable to the results seen by Pollock's group in their work with the cat. Comparative tests were also made and their analysis is being prepared.

Summary

A series of electrical tests were performed on 70 muscles of poliomyelitis patients and the results of 201 strength frequency tests (whose grade varied from zero to grade 4) were reported.

Five general types of curves were defined and their occurence in each muscle grade noted.

Denervated muscle showed the *A* type of curve most frequently, although *B* and *C* type curves were also seen in significant proportions.

Recovering muscles showed the *D* and *E* type curves most frequently.

An explanation for the occurrence of these curves is discussed.

Our observations to date regarding strength frequency testing indicate that this type of electrical test is often of diagnostic and prognostic value when properly correlated with the clinical and other evaluations of the patient.

7. Watkins, A. L.: Electrophysiology as Applied in Physical Medicine, Brit. J. Phys. Med. **10**: 172-176 (Nov.-Dec.) 1947.

RESISTIVE EXERCISES IN THE TREATMENT OF FUNCTIONAL DISORDERS OF THE FEET *

ODON F. VON WERSSOWETZ, M.D.

Professor of Physical Medicine, Meharry Medical College and

Chief, Physical Medicine Rehabilitation Service, Thayer Hospital.

NASHVILLE, TENN.

The human foot, as it evolved through the ages from the relaxed, flat, grasping organ, has changed to a purely supportive postural structure by adaptation of structure and form to function. The muscles of the foot were first used for grasping and for steadying the leg on the foot. As the mode of locomotion changed and the erect posture was attained, the foot architecture was altered and the great toe and heel, features peculiar to man, were developed. The longitudinal arch came into being, and a heel-and-toe gait was acquired.

This altered structure of the foot and the present day footwear, which limits the freedom of the foot, are the major factors responsible for the numerous foot disabilities. In general, however, foot strain may be considered as an imbalance of the foot load over foot muscles. The common complaints are due to weakness of the longitudinal arch. This arch is sustained by a series of muscles. For convenience, these muscles can be divided into two groups: (1) the extrinsic muscles, which have their origin in the leg and their insertion into the bones of the foot, and (2) the intrinsic muscles, which have their origin and insertion in the foot alone. In a foot working under the best mechanical conditions, one of these two groups is necessary to the other for efficient function.

The important extrinsic muscles are the tibials, the peroneus longus, and the flexor hallucis longus. The intrinsic muscles play a very important part in the coaptation of the bones of the foot during weight-bearing, thus preserving the longitudinal arch as they actually form its bowstring. Imbalance occurs, giving rise to unequal strain on these muscles, when they are not functioning properly. This strain is mostly on the intrinsic muscles and those extrinsic muscles which pass below the internal malleolus. This not only stretches these muscles but also, and this is of more importance, puts them into an adverse position in which, mechanically, they are less able to apply the force of their contraction to the full extent. When present, these two factors must necessarily tend to weaken those muscles under tension and so cause a greater or less change in the normal muscular balance of the foot.

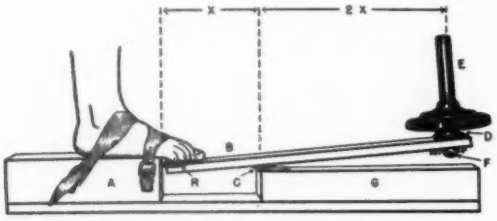
In the treatment of functional disorders of the foot, exercise is of more importance than mechanical supports, which are too generally used in such cases. The purpose of therapeutic exercise should be the systematic strengthening of the muscles on the inner border of the foot. It would seem apparent that to increase power in these muscles, resistive exercises should be recommended. However, as simple as this may seem, it has not been advocated. In analyzing the conventional exercises employed for weak or flat feet, it becomes evident that such exercises are of value only for developing endurance and joint motion. They will not develop power or strength. This

* Published with permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or the conclusions drawn by the authors.

is accomplished only by the muscles contracting with the maximal voluntary effort against the maximal optimal resistance.

Method and Apparatus

To provide progressive resistive exercise to the muscles maintaining the longitudinal arch, a special apparatus was constructed (fig). This apparatus consists essentially of a foot rest and a lever. The toe flexors working one end of the lever raise a given weight on the other end. Because the excursion of the toe flexors is small, the fulcrum of the lever is placed so that it is close to the foot. The result is that the weight has a greater excursion. The exercises are carried out with the foot positioned so as to place the edge of the foot rest just proximal to the metatarsal heads. Two straps are used to stabilize the foot. The knee is flexed at a right angle, and the leg is perpendicular. The weight end of the lever is so arranged that bar-bell weights can be added easily. The routine is similar to that suggested by DeLorme.[1]



Apparatus for providing resistive exercises to the muscles maintaining the longitudinal arch of the foot. *A*, foot rest with straps; *B*, lever; *C*, hinge, or fulcrum of lever; *D*, collar for attachment of bar-bell weight; *E*, bar-bell weight; *F*, rubber shock absorber; *G*, wooden base; *R*, leather toe rest.

In the present experimental procedure, 40 repetitions are recommended. At the beginning of treatment, the maximal muscle load that the muscles can move 10 times through the full range of motion is determined by a gradual increase of the exercise load. Muscle load is defined as the actual resistance the muscles must overcome during the exercise. In our procedure, it was twice that of the exercise load because of the 2:1 ratio of the lever. The exercise load is the load placed upon the weight-bar of the apparatus and the weight of the apparatus. After the maximal muscle load is determined, a schedule of treatment is set up. It is important to impress on the patient that all movements should be done smoothly, rhythmically, and without haste. At the height of full plantar flexion of the toes, there should be a short pause of one or two seconds, but it should not be excessive in holding the weights, as this will tire the patient. At first the exercise load (weight) is decreased by 3¾ pounds, and the muscles are exercised 10 times against this resistance. Thereafter 1¼ pound weights are added, and the procedure is repeated until the maximal muscle load is reached. Treatments are administered twice a day.

Load-Resisting Exercises Schedule

	Load, Lb.
First set of 10 repetitions of maximal exercise load minus	3¾
Second set of 10 repetitions of maximal exercise load minus	2½
Third set of 10 repetitions of maximal exercise load minus	1¼
Fourth set of 10 repetitions of maximal exercise load minus	0

The maximal exercise load is increased as soon as it becomes evident that it does not provide sufficient resistance.

1. DeLorme, T. L.: Restoration of Muscle Power by Heavy Resistance Exercises, J. Bone & Joint Surg. 27:645 (Oct.) 1945; Heavy Resistance Exercises, Arch. Phys. Med. 27:607 (Oct.) 1946; Techniques of Progressive Resistance Exercise, Arch. Phys. Med. 29:263 (May) 1948.

Comment

To date only a few patients have been treated by this method and only for a short time. Therefore, no definite conclusions can be reached because the time required for the development of maximum power in a muscle is not known; it is believed that this requires months of consistent work. In one patient it has been observed that there was some subjective improvement after two weeks of treatment. He reported that the pain had subsided and the foot felt more elastic. Since strength is required in these muscles of the foot, it must be realized that patients suffering from muscular weakness must continue treatment indefinitely.

Summary

The form and function of the foot as an organ of balancing support and elastic propulsion is the result of evolution. To maintain strength in such a foot, it is essential that all of its parts retain their normal physiologic function. Foot strain usually develops as a result of imbalance of the foot load over the muscles.

Present-day exercises, generally prescribed for such conditions, do not accomplish the main aim of strengthening the muscles taking part in the maintaining of the longitudinal arch. For this reason, an apparatus was devised that provides graduated progressive resistive exercises along the general outline suggested by DeLorme.

It is realized that the suggested treatment is not a panacea for all foot disorders and that it is only one of several measures, but it is believed that most patients will benefit from its application. Certainly it should be used as adjunct therapy.

So far, the qualitative evidence seems to support the hypothesis that resistive exercises are of great value in the management of functional disorders of the foot.

NECK TRACTION IN THE HORIZONTAL POSITION

WILTON H. ROBINSON, M.D.

Orthopedic Surgeon to South Side and St. Joseph Hospitals

PITTSBURGH

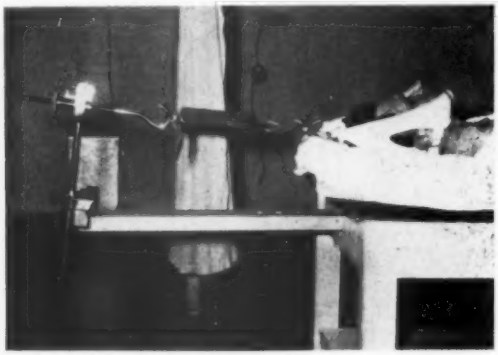
Traction of the neck by the use of the head sling has a definite value in some painful conditions of the neck and occasionally of the arm.

Krusen advises its use in cases of radiculitis secondary to hypertrophic arthritis of the cervical vertebrae, of torticollis, and of narrowing of the intervertebral spaces when such is shown on the x-ray.[1]

Overhead traction is very generally used. We have substituted horizontal for overhead traction because we believe (1) that it is more comfortable for the patient, (2) that it is under better control, and (3) that the results are very much better.

In addition to the indications given by Krusen, we also use it for relief of painful acute spasmodic conditions usually shown on the x-ray by the straightening of the cervical spine.

It is unnecessary and undesirable to use heavy traction. When the patient is in the horizontal position, the problem of gravity is eliminated. A pull of 20 to 35 pounds is generally sufficient, although 40 pounds may be



Neck traction apparatus in use.

used for short periods. For the bed patient with, for instance, fracture of the cervical spine who is under continuous traction with skeletal tongs, 10 or 20 pounds is sufficient, although in such a case also we may increase the weight to 40 pounds for short periods.[2]

The device illustrated herewith has been satisfactory. It consists of (1) a wooden sliding piece 2 by 4 by 60 in. under the top of an ordinary treatment table (slots are cut in the under pieces of the table to admit it, and ½ in. holes are drilled to permit the use of a peg to hold it out as far as possible). (2) an upright as shown with a long screw at its top to make traction in the amount desired; (3) a 50 lb. spring scale, and (4) a head sling. This particular

1. Krusen, F. H.: Physical Medicine: The Employment of Physical Agents for Diagnosis and Therapy, Philadelphia, W. B. Saunders Company, 1941, pp. 672-678.
2. Watson, Jones, R.: Fractures and Joint Injuries, Baltimore, Williams & Wilkins Company, 1944, Vol. I, pp. 339-346.

equipment has a II-shaped piece to fit over a corresponding block on the extension. There are many ways, of course, to obtain the same effect.

Summary

Neck traction is of definite value in treatment of hypertrophic arthritis of the cervical vertebrae, torticollis, narrowing of intervertebral spaces, and certain painful acute spasmodic conditions shown roentgenographically by straightening of the cervical spine. It is best given in the recumbent position. The amount of traction should never be excessive. Suggestions are made as to apparatus necessary. The amount of traction should be exactly measured either by spring scale or by weights.

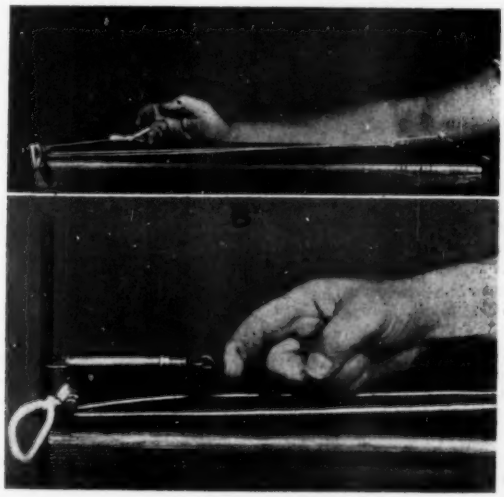
A DYNAMOMETER AND EXERCISER *

J. L. RUDD, M.D.

Chief, Physical Medicine Rehabilitation Service Veterans Administration Hospital.

WEST ROXBURY, MASS.

A simple combination instrument has been developed for the measurement of the muscular strength of the fingers as well as an exerciser for the digits (fig.). It has been found effective in early treatment of hand injuries,



Dynamometer and exerciser.

when only the mildest form of resistance exercise is tolerated and when measurements of strength and slight gains in strength are important.

* Sponsored by the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the author are a result of his own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

The dynamometer can be made easily for use in the office or in the home.

The apparatus consists of a 4 lb. wood board, 22½ in. long, 5½ in. wide, and 1¾ in. thick, with a small iron upright on one end and two springs, of different thicknesses, attached to the other end of the board. A standard windowshade cord with a ring attachment to be grasped by the involved finger, thumb or a segment of the digit is strong enough to stand the tension exerted by a patient soon after operation on a hand. A wider board can be built with more springs of varying tensions, but a two-spring exerciser is all that is needed in most cases to prepare the patient for more strenuous activity. An obstetrical home baby scale (fig. *B*), has proved to be sufficiently accurate not only for the practical measurement of strength increases but also as a method for providing a mild progressive resistance exercise suitable to injured hands capable of little early activity.

Depending upon the way the hand is placed, exercises can be given to any portion of a digit, whether it be for motion in flexion, extension, adduction, abduction or opposition. Almost any exercise for the phalanges is possible with the use of a little ingenuity in immobilization of that portion of the finger that does not participate in the activity.

Correspondence

Exercise in the Treatment of Asthma

To the Editor:—Having read the interesting paper of Dr. Frances Baker on "Exercise in the Treatment of Asthma" in *Archives of Physical Medicine*, Jan., 1951, page 30, I wish to correct one statement of the author who seems, I am glad, to be very familiar with one or two of my publications on the same matter. Dr. Baker imputes me the assertion that stimulating massage of the thorax with heavy kneading and clapping brings about a relaxation. I am sorry to be misunderstood. By this vigorous massage we are only able sometimes to dislodge mucus and to ease expectoration. Thereby the vital capacity of the patient may be increased by 50 to 250 cc. Many sufferers report on a relief of the suppressive feeling in the chest after the massage. In occasional patients it is important to "massage away" by deep frictions myalgic spots in the pectoral or intercostal muscles which interfere with effortless breathing. Otherwise relaxation may be brought about by concentrating on the breathing pause between lengthened expiration and shortened inspiration. Moreover I want to stress that in the physical training of the patient, whether in gymnastics, when playing a game, or when boxing, the patient should make a practice of breathing out with a hissing sound when making a muscular effort. No attention need be paid to inspiration. This rule is at least as important as usual strict breathing exercises or as the overrated diaphragmatic breathing exercises.

DR. MED., H. I. WEISER,
Tel-Aviv.

To the Editor:—It gives me pleasure to know that Dr. Weiser has read the article, "Exercise in the Treatment of Asthma." He has done a great deal of work with asthma.

As I stated in my paper, I do not use massage and have not found it necessary. He uses it where tenderness exists and he states that he feels that it assists in the removal of plugs. Naturally, where tenderness exists we treat them as we would if asthma were not present.

I feel that he is missing a point when he does not emphasize the correct manner of inhalation as well as exhalation as there is a great tendency to pull in or suck in the upper abdomen with inhalation. This definitely interferes with the amount of air that can be brought into the lung space. I find that patients learn how to breathe much more quickly when we emphasize inhalation with the diaphragm lowered and the abdomen ballooned out as well as the long exhalation by whatever means seems best.

I feel that the manner of training in breathing is the most important thing, that other agents may be used and that following this training, a gradual increase in exercise is very important.

FRANCES BAKER, M.D.,
San Mateo, Calif.

ARCHIVES of PHYSICAL MEDICINE

OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL MEDICINE

.·. EDITORIALS .·.

ROY W. FOUTS

1885-1951

Dr. Roy W. Fouts, one of the founders of the American Congress of Physical Medicine, former Vice-President of the American Medical Association and Speaker of the House of Delegates, radiologist, and medical legal consultant, died March 27, 1951, after a long illness. He was 65 years old, having been born May 10, 1885, in Davis County, Iowa. He was graduated from the Southern Iowa Normal School in 1902 and from the College of Physicians and Surgeons of Chicago, School of Medicine of the University of Illinois, in 1909. After practicing in Dawson and Fall City, Iowa, and serving as an

Army medical officer in World War I, he moved to Omaha in the early 1920's During his years of practice he served as Division Surgeon, Chicago and North Western Railway; medical adviser, Nebraska Workmen's Compensation Court; president, Nebraska State Medical Legal Defense Committee; chairman, Medical Preparedness Committee of the American Medical Association for the Seventh Corps Area, and chairman, Procurement and Assignment Service for the Seventh Service Command. He was the first Secretary-Treasurer of the American Congress of Physical Therapy, holding this office until he was elected President, in 1930.

THE ATLANTIC CITY MEETING

Now that our specialty has come of age, we must accept greater responsibilities. One of these is to support our section meeting at the annual session of the American Medical Association in Atlantic City this June. The program is one that should be of interest to the general practitioner as well as physiatrists. The titles of the papers to be presented are published elsewhere in this issue of the ARCHIVES.

Our section meets in the Ocean Room of the Hotel Marlborough-Blenheim at 9:00 A. M. on Wednesday, Thursday, and Friday, June 13-15. The always important subjects of Physical Medicine in relation to the treatment of fractures, arthritis, poliomyelitis, and neurological conditions such as multiple sclerosis, hemiplegia, cerebral palsy, and facial paralysis will be brought up to date. Newer advances in techniques are also to be discussed including ultrasonics, assistive devices for the severly handicapped including amputees, and progressive resistance exercises.

The business meeting should be attended by all physiatrists on Thursday morning preceding the chairman's address on "The Present Obligation of Physical Medicine and Rehabilitation," by Dr. George Morris Piersol.

The Scientific Exhibit is always one of the most popular and instructive aspects of the American Medical Association sessions. Awards are to be chosen for the most meritorious exhibits from each section. We will have nine exhibits in our section which illustrate quite forcefully the broad scope of our chosen specialty. The subjects include artificial respiration, ultrasonics, occupational therapy, self-help devices in rehabilitation, cerebral palsy, lame back, frostbite, and electrotherapy. Certainly there will be much for all of us to learn from these papers and exhibits, to say nothing of the galaxy of presentations of the other sections.

All members of the American Congress of Physical Medicine are urged to attend the annual session of the American Medical Association in Atlantic City, June 11-15, and especially to support the Section on Physical Medicine and Rehabilitation.

IMPORTANT NOTICE

Certified diplomates of the American Board of Physical Medicine and Rehabilitation who wish to replace their certificate which carried the former name, American Board of Physical Medicine, may order a replacement certificate at a cost of $3.00. Orders and checks should be sent to the American Board of Physical Medicine and Rehabilitation, 30 North Michigan Ave., Chicago 2, Illinois.

MEDICAL NEWS

Boston's New Rehabilitation Center

A new public center for the rehabilitation of handicapped and crippled will be opened in Boston about June 1.

This announcement was made in a joint statement by the three agencies responsible for the creation of the center — the Bay State Society for the Crippled and Handicapped, Inc., which will supply the operating funds; the Massachusetts General hospital, which will supply the quarters, and the Bay State Medical Rehabilitation Clinic, the original organization which, for more than four years, has been working for the establishment of such a project and which will undertake its direction and administration.

Medical director of the clinic will be Dr. Arthur L. Watkins, chief of physical medicine at Massachusetts General hospital. Dr. Watkins will be assisted by a physical and occupational therapist and a rehabilitation counselor, whose background will be in the field of social work.

Executive director will be George L. Batchelder, Jr., of North Beverly.

The clinic is scheduled to be housed in a ward of the Massachusetts General hospital. However, the Bay State Medical Rehabilitation Clinic's president, Dr. Augustus Thorndike, emphasizes that the center will be completely independent of the MGH, serving all hospitals and medical staffs in the greater Boston and New England areas. Dr. Thorndike declared:

> The Bay State Medical Rehabilitation Clinic has been established with the belief that every handicapped person has a right to function at his maximum level of personal satisfaction and social usefulness. Especially in view of our present national emergency and the resultant drain on our labor resources, the Clinic takes on added importance and vital character. It is our aim to make employable, as many handicapped persons as possible, but only after careful diagnostic analysis has indicated that there exists a chance for rehabilitation in each individual case.
>
> Purpose of the Clinic is to supply a central agency for physically handicapped persons who are striving to make the transition between hospital discharge and useful, productive living. It will serve also as an evaluation clinic, where it is understood, patients will be accepted only if something can be done for them and will be discharged when nothing more can be accomplished. Cases which are not accepted, will be referred to other agencies which deal with the particular disabilities not handled by the clinic.

Session on Physical Medicine New York State Medical Society

The annual meeting of the Medical Society of New York State was held in Buffalo, April 29 to May 3. The session on physical medicine, May 2, consisted of the following program: "Physical Medicine for the Neurologic Patient," Dr. Arthur L. Watkins, Boston (by invitation); discussion, Dr. William Beswick, Buffalo; "Combined Use of Cortisone and Physical Therapy in the Treatment of Arthritic Deformities," Dr. William B. Snow and Dr. James A. Coss, New York City; "Aftercare for the Poliomyelitis Patient," Dr. Morton Hoberman, New York City. The officers of the section presided, Thomas E. Walsh, M.D., Syracuse, Chairman and William Bierman, M.D., New York City, Secretary.

Chicago Society of Physical Medicine and Rehabilitation

Wednesday, May 23, 1951 — 8:00 p. m.

Room 106, University of Illinois Medical School, 1853 W. Polk Street, Chicago.

Dinner, 6:30 p. m., Medical Center, Y. M. C. A., 1804 W. Congress Street.

Business meeting immediately following dinner.

Program —

Room 106, University of Illinois Medical School, 1853 W. Polk Street, Chicago.

"Ultrasonics in Physical Medicine."

Dr. Frank H. Krusen,

Professor of Physical Medicine, Head of Section on Physical Medicine and Rehabilitation, Mayo Clinic, Rochester, Minnesota.

Physicians, other professional personnel and their guests are welcome.

Louis B. Newman, M.D.,
President.
Arthur A. Rodriquez, M.D.,
Secretary-Treasurer.

Personals

Dr. **Arthur L. Watkins** has been promoted to assistant clinical professor of medicine at Harvard medical school.

Dr. **Ralph E. Worden** has been appointed assistant professor of physical medicine and rehabilitation, Ohio State University college of medicine, Columbus, Ohio. Dr. Worden will be director of the department of physical medicine and rehabilitation at the University Hospital and at the Children's Hospital.

Dr. **Malcolm T. MacEachern,** retired director of the American College of Surgeons, has been appointed director of professional relations of the American Hospital Association. He is also director of the course in hospital administration at Northwestern University Medical School.

Dr. **John F. Fulton,** Sterling professor of physiology and chairman of the department in the school of medicine, Yale University School of Medicine, has recently been named to fill the newly created position of Sterling professor of the history of medicine. Doctor Fulton assumed the new professorship on February 1 and relinquished his duties as Sterling professor of physiology and chairman of the department. He will, however, continue certain phases of physiological research.

Doctors Given Medical Manual by Multiple Sclerosis Society

Approximately 10,000 physicians in this country and abroad have recently been given a comprehensive medical manual, *Multiple Sclerosis and Its Treatment*, by Dr. George A. Schumacher, prepared under the auspices of the National Multiple Sclerosis Society. Doctor Schumacher is professor and chairman of the division of neurology, University of Vermont College of Medicine, as well as a member of the medical advisory board of the society. The medical manual includes an analysis of essential criteria involved in diagnosis, as well as a critical review of current forms of therapy used in the treatment of multiple sclerosis.

According to Doctor Schumacher, "As yet there is no satisfactory form of treatment for the syndrome of multiple sclerosis, despite the large amount of published material concerning this subject." It is known, however, that certain forms of treatment have been helpful in the relief of symptoms in some cases. Most forms of treatment are still in the experimental stage.

Because of the wide variety of symptoms and the fact that multiple sclerosis is characterized by remissions and new attacks, the disease is not easily diagnosed and has in some cases been misdiagnosed. It is expected that the information on diagnosis presented in the manual will help facilitate diagnosis.

Medical Seminar in Cardiovascular Diseases

The Mount Sinai Hospital of greater Miami announces its first annual medical seminar in cardiovascular diseases to be held at the Sorrento Hotel, May 23, 24 and 25, 1951. Guest speakers will include Dr. David I. Abramson, Chicago; Dr. Claude S. Beck, Cleveland; Dr. Samuel Bellet, Philadelphia; Dr. John Gofman, Berkeley, Calif.; Dr. Seymour S. Kety, Philadelphia; Dr. Charles W. Robertson, Boston, and Dr. Otto Saphir, Chicago.

Physical Therapy Section Middle Atlantic Hospital Association

The combined chapters of the American Physical Therapy Association from the States of New York, New Jersey and Pennsylvania are sponsoring the following program during the annual meeting of the Middle Atlantic Hospital Association. The program will be presented Friday, May 25, in Convention Hall, Atlantic City, N. J.

The program will open at 10 a. m., with an assignment yet to be announced. At 11 a. m. Dr. Robert Leopold will present "Multiple Sclerosis." The afternoon program which opens at 2 p. m., will consist of a panel discussion on "Rehabilitation — All for One." Dr. Frederick J. Knocke, Adjunct Orthopedist, Lenox Hill Hospital, New York, will act as coordinator. Members of the panel are: Mrs. Margaret Young, medical social worker, Hospital for Special Surgery, New York; Miss Ellen Covell, educational director, Association for the Aid to Crippled Children, New York; Miss Margaret Moore, educational consultant, American Physical Therapy Association; Miss Eleanor Anderson, administrative assistant in physical therapy, Visiting Nurse Association, Brooklyn; and an occupational therapist and a psychologist, to be announced.

Kenny Foundation Scholarships

The Sister Elizabeth Kenny Foundation, with offices in Minneapolis, announces the availability of Kenny therapist training scholarships totaling $5,400 each for registered nurses and physical therapists. Designed to qualify trainees to become Kenny therapists in the treatment of poliomyelitis, the 24 months course will start June 20 at Minneapolis, according to Dr. Miland E. Knapp, chief of physical medicine in charge of treatment and training at Elizabeth Kenny Institute. Purpose of the course is to prepare carefully selected persons who are interested in scientific postgraduate training in the management of poliomyelitis under the supervision of physicians. Scholarships are paid at the rate of $225 per month, and tuition for all courses will be provided by the Kenny Foundation. On graduation Kenny therapists are assured of assignment to a Kenny treatment facility. Salaries start at $285 a month and reach $355 through automatic increases at six month intervals. Additional opportunities for advancement, with increased compensation, are available. Details and an application blank may be obtained by writing the Director of Training, Sister Elizabeth Kenny Foundation, 1800 Chicago Avenue, Minneapolis 4.

Apparatus Accepted

Teca Model CD7 Universal Low Volt Generator. — The Teca Model CD7 Universal Low Volt Generator with Variable Frequencies is intended to meet all the requirements for direct current therapy and for the stimulation of innervated and denervated muscle by electric current. The manufacturer is the Teca Corporation, 220 West 42nd Street, New York 18. The Council on Physical Medicine and Rehabilitation voted to include the Teca Model CD7 Universal Low Volt Generator in its list of accepted devices.

Burdick MS-2 Muscle Stimulator. — The Burdick Model MS-2 Muscle Stimulator is a generator which provides both faradic and galvanic current. The faradic current is generated electronically by a sharp impulse in the primary coil of a transformer and has especially high voltage peaks of short duration. It can be surged automatically or by means of a control which varies resistance. The device requires a source of 60 cycle alternating current at 115 volts. It draws 35 watts, corresponding to 0.3 ampere. The Council on Physical Medicine and Rehabilitation voted to include the Burdick MS-2 Muscle Stimulator in its list of accepted devices.

Hydro Thermal Unit. — The Hydro Thermal Unit applies heat by means of water circulating through a coil of rubber tubing. This coil, referred to as the Hydro Mat, is one of the essential parts; the other is an electrically operated pump with a thermostatically controlled heating arrangement. The Hydro Mat is placed in apposition to the part to be warmed, while the pump, mounted on casters, stands by the bedside. The motor operates only on alternating current at 120 volts, and it draws 200 watts of power. The manufacturer is Hydro Thermal Units, Inc., 901 North State Street, Chicago 10. The Council on Physical Medicine and Rehabilitation voted to include the Hydro Thermal Unit in its list of accepted devices.

Research Grants in Muscular Dystrophy

The Muscular Dystrophy Association, Inc., has announced that it will consider applications for grants. The association is presently supporting a large investigative program in this disease at the New York Hospital-Cornell Medical Center. Information can be obtained by writing to the Executive Director, Muscular Dystrophy Association, Inc., 177th Street and the Harlem River, New York 53, New York.

New Medical School to Open

The University of California at Los Angeles' new medical school will open its doors to the first class of students next September 19. Requests for information about applications should be addressed to U. C. L. A.'s Office of Admissions, 405 Hilgard Avenue, Los Angeles 24. The first class will use teaching material provided by the 750 bed Harbor General Hospital in Torrance and the 1,500 bed U. S. Naval Hospital at Long Beach.

Dr. Stafford L. Warren, formerly professor of radiology at the University of Rochester (N. Y.) School of Medicine and Dentistry, was appointed dean of the medical school in 1947. Assistant dean is Dr. Norman Nelson, former medical director of the Los Angeles City Health Department. Department heads include: surgery, Dr. William P. Longmire, Jr.; medicine, Dr. John S. Lawrence; anatomy, Dr. Horace W. Magoun; infectious diseases, Dr. Charles M. Carpenter; obstetrics and gynecology, Dr. Daniel G. Morton; radiology, Dr. Andrew H. Dowdy; pediatrics, Dr. John M. Adams, and hospital administration, Kenneth M. Eastman. This staff has been doing medical research, organizing curricula and working on plans for the $15,500,000 U. C. L. A. Medical Center. The statement issued by President Sproul and Dean Warren reads as follows: "The School of Medicine at the University of California at Los Angeles has been in its organizational stages for the last several years, and another several years will be required for completion of the physical facilities. However, sufficient space has been made available on the campus and on nearby university property to accommodate a small first-year class in the fall of 1951. In the ensuing years it will be possible to provide for the new classes as they enter and the old classes as they progress."

Education Foundation Elects Officers

At the first annual meeting of the corporation of the American Medical Foundation the following officers were elected: president, Dr. Elmer L. Henderson, of Louisville, president of the American Medical Association; vice-president, Dr. Harvey B. Stone, of Baltimore; secretary and treasurer, Dr. Donald Anderson, secretary of the Council on Medical Education and Hospitals.

The purpose of the Foundation is to promote the art and science of medicine and the betterment of the public health by providing or aiding in the providing of financial aid to recognized schools or institutions of medical education responsible for the education and training of the medical manpower of the nation.

The board of Directors were informed by Dr Louis H. Bauer, chairman of the Board of Trustees of the American Medical Association, that the American Medical Association would absorb all the expenses of the Foundation so that none of the money contributed will be used to meet overhead expenses.

The Foundation was established in December, 1950, at the meeting of the American Medical Association in Cleveland, when the Board of Trustees announced an appropriation of one-half million dollars as the nucleus of the fund. Other contributions have been received since then, including one of $100,000 from the California Medical Association. It was announced at the meeting of the Board of the Foundation that each physician is being asked to contribute at least $100 annually to the Foundation for redistribution to the medical schools of the country.

Conference on Aging

The University of Michigan announces its Fourth Annual Conference on Aging to be held in Ann Arbor, July 11-13. Rehabilitation of the older handicapped person will be the topic of this year's conference, with special emphasis upon the theme that "All Are Needed." American and foreign authorities will be available to discuss the questions raised by the working conference. Attention will be directed to medical, psycho-social, economic and vocational aspects of retaining the over 40 workers in the labor force and the role of these workers with reference to mobilization. Exhibits on the preventive and restorative phases of rehabilitation are planned. The conference is under the co-sponsorship of the Institute for Human Adjustment, School of Medicine, School of Public Health and Extension Service of the University of Michigan, the Office of Vocational Rehabilitation of the Federal Security Agency, and the Michigan Department of Vocational Rehabilitation.

The Scientific Exhibit Section on Physical Medicine and Rehabilitation — American Medical Association — Atlantic City, New Jersey — June 11, 12, 13, 14, 15, 1951

The representative to the Scientific Exhibit from the Section on Physical Medicine and Rehabilitation is Arthur L. Watkins, Boston.

Artificial Respiration — Recent Advances in Manual Methods

Archer S. Gordon, Frank Raymon and Andrew C. Ivy, University of Illinois College of Medicine, Chicago.

The exhibit presents a survey of the extensive recent experiments on manual artificial respiration by the authors. The studies include observations of the effects of manual resuscitation as measured on (1) warm corpses, immediately after death and before the onset of mortis, (2) totally apneic normal human adults, and (3) conscious volunteers with suspended respiration. The new "push and pull" methods and all of the standard manual methods are included in the evaluation of the efficacy of (1) pulmonary ventilation, (2) cardiodynamics and (3) operator fatigue.

In the exhibit, the standard and the newer methods of resuscitation are demonstrated by models. An extensive pictorial history of resuscitation is included. Graphic and diagrammatic representation of the results of recent surveys complete the exhibit. A human demonstration will be presented.

Effects of Ultrasonic Energy on Tissues

Julia F. Herrick, Frank H. Krusen, Gordon M. Martin and Earl C. Elkins, Mayo Foundation, Rochester, Minn.

Ultrasonic energy is a relatively new agent in physical medicine. A number of European physicians have been using ultrasonic vibrations during the last ten years for both therapeutic and diagnostic purposes. They report successful therapeutic results in a wide variety of conditions. As a new tool for medical diagnosis they report that it has proven valuable in locating brain tumor. This exhibit describes some effects which have been found when ultrasonic energy is applied to certain tissues in the experimental animal.

Occupational Therapy

Erna L. Rozmarynowski, Washington University School of Medicine, St. Louis, Mo.

The exhibit illustrates the relation between professional training in occupational therapy as applied to the professional practice of occupational therapy. Professional training in a specific occupational therapy activity as applied in professional practice is shown. The exhibit shows the value of occupational therapy in various aspects and include: prevocational exploration through industrial techniques; social adjustment through group work activities; preservation of hand mobility; graded exercise of the geriatric tuberculosis patient; pediatric occupational therapy and occupational therapy for the home bound. The above are illustrated through photography which demonstrates a variety of media in use both by the occupational therapy student and the patient.

Self-Help Devices for Rehabilitation

Howard A. Rusk, George G. Deaver and Donald A. Covalt, New York University-Bellevue Medical Center, Institute of Physical Medicine and Rehabilitation, New York.

The exhibit consists of photographs and models of self-help devices which can be utilized by physically handicapped persons to perform the basic activities of daily living. When physical improvement has reached a maximum, many persons are left with residual disabilities that make it impossible for them to perform functional activities without assistance, but the means of simple mechanical devices many times makes it possible for the physically handicapped person to perform the activities necessary in work and self-care without assistance. (This exhibit was made possible through a research grant from the National Foundation for Infantile Paralysis.)

Evaluating the Physical Disabilities of the Cerebral Palsied

F. A. Hellebrandt and Sara Jane Houtz, Medical College of Virginia, Richmond, Va., and National Society for Crippled Children and Adults, Inc.

The material covers types of disability evaluation selected to demonstrate the clinical application of relatively simple physiological methods: (1) factors influencing the biomechanics of the stance of a typical athetotic patient; (2) influence of the so-called stabilizer on postural alignment and the location of the center of gravity; (3) application of measured (exercise) stress in the study of the respiratory patterns of the cerebral palsied; (4) methods of studying the balance of power between agonists and antagonists acting on representative joints; (5) the use of ergographic exercise for the restitution of strength and measurement of progress; (6) chronophotographic analysis of movement patterns. A patient will be used for the demonstration.

Management of the Painful Low Back of Muscular Origin

Hans Kraus, Allen S. Russek, Edward E. Gordon and Ann Whittlesey, New York University-Bellevue Medical Center, Institute of Physical Medicine and Rehabilitation, New York.

The exhibit shows (1) different diagnosis of muscular low back; (2) clinical examination to determine types of painful low back of muscular origin; (*a*) examination for muscle weakness; (*b*) examination for deep tenderness (trigger points); (*c*) examination for subcutaneous tenderness (fibrositis); (*d*) examination for postural alignment; (3) treatment: (*a*) trigger points; (*b*) muscle weakness; (*c*) fibrositis; (*d*) postural deformities.

Research in Hemiplegia

Joseph G. Benton, Henry Brown, Gerald Hirschberg, Morton Marks and Morton Nathanson, New York University College of Medicine, New York.

There is a demonstration of: (1) the effects of various cerebro-vascular dilating drugs on the time course of rehabilitation of the hemiplegic patient; using the double blind method, the effects are compared with placebo medication in comparable groups of patients; (2) a study of the patterns of the hemiplegic gait as determined by force plate studies, stroboscopic photographs and electromyography; the patterns of the involved leg are compared with those of the uninvolved; the influence of bracing is noted.

Techniques and Research Studies on the Treatment of Frostbite

Colonel Robert B. Lewis, USAF (MC) United States Air Force School of Aviation Medicine, Randolph Air Force Base, San Antonio, Texas.

The exhibit contains a visual display of the long range study conducted at the United States Air Force School of Aviation Medicine on the physiological effects of frostbite showing the advanced developments on technique and treatment.

Electrotherapy — A Portable Electric Stimulator for Home Use

Sedgwick Mead and Emily E. Mueller, Washington University School of Medicine, St. Louis, Mo.

The exhibit consists of charts and demonstration models of electrical stimulators, designed to provide portable inexpensive units with basic wave forms for home treatment and diagnostic purposes.

BOOK REVIEWS

MULTIPLE SCLEROSIS AND THE DEMYELINATING DISEASES. PROCEEDINGS OF THE ASSOCIATION FOR RESEARCH IN NERVOUS AND MENTAL DISEASES, DECEMBER 10 AND 11, 1948, NEW YORK. Volume XXVIII. Price, $12.00. Cloth. Pp. 675, with 153 illustrations and 124 tables. Williams & Wilkins Company, Mt. Royal and Guilford Avenues, Baltimore 2, 1950.

Thorough familiarity with present information on all aspects of multiple sclerosis is essential for the specialist in physical medicine and rehabilitation. This disease is responsible for a sizeable number of patients with chronic disability, most of whom can be benefited to some degree by the services of a physiatrist. This collection of papers presented before the Association for Research in Nervous and Mental Diseases gives an excellent summary of our present state of knowledge as to theories of etiology, and possible mechanisms of production of the pathologic changes, including even a theory of psychogenic etiology. The microscopic lesions have been summarized and correlated with clinical course and prognosis. Several chapters are devoted to the psychologic aspects which are of so much practical importance. Some of the newer methods of treatment are discussed, but there is no detailed information given as to the role of physical medicine, as procedures similar to those utilized for other chronic neurological diseases are assumed to be employed. Although the answer to the problem of multiple sclerosis still eludes us, the direction of future research endeavors is clearly indicated. It is certainly valuable to review the progress in research as in this symposium to clarify new avenues of attack. Recommended as a valuable reference for neurologists and physiatrists.

DIATHERMY: THE USE OF HIGH FREQUENCY CURRENTS. By *Stafford L. Osborne*, B.P.E., M.S., Ph.D. Professor and Chairman, Department of Physical Medicine, Northwestern University Medical School. Cloth. Price, $3.00. Pp. 113 with Illustrations. Charles C Thomas, Publisher, 301-327 East Lawrence Avenue, Springfield, Illinois, 1950.

The preparation of this book must have been an unpleasant assignment for Doctor Osborne. As an authority on the physical principles and theories involved in the high frequency currents and as a teacher of this subject for many years, it must have been difficult for him to write a book that would be "useful to the medical student and physical therapist as well as the general practitioner." For these readers the inclusion of technical material without sufficient explanation will be confusing; examples of this are the operation of the high frequency generator for electric field application, autocondensation, Schmitt's optimal dosage technique and others. The controversial discussion of blood flow on the use of microtherm will hardly interest this group of readers. The pages given over to the specific technique of applying the pad electrodes for the various areas of the body will give the less experienced user of these methods the impression that the greatest importance is to secure just the right size of electrode.

Other items that might be questioned is the necessity of devoting 16 pages out of a total of 110 for the conventional diathermy which even in the author's opinion is "being rapidly replaced by the short wave diathermy"; in the section covering contraindications why quote the 17 lines of Bauwens' justifying the use of the diathermy in peripheral nerve lesions; the five and one-half pages lifted from the 1945 *Handbook of Physical Medicine* on the clinical applications which contain considerable information about the clinical conditions and only incidently considers the diathermy; and included in the general principles of the technique, the advice is given that metal beds should not be used; however, numerous illustrations show the patients receiving the treatments while in a metal bed without the "special precautions" being taken.

It is unfortunate that Doctor Osborne did not prepare the book so as to appeal to physiatrists and other professional groups who are interested in the diathermy. He is most ably qualified to write about the history, physical properties, physiological principles and similar material involved in these currents.

PULMONARY VENTILATION AND ITS PHYSIOLOGICAL REGULATION. By *John S. Gray*, M.D., Ph.D., Professor of Physiology, Northwestern University Medical School, Chicago, Illinois. Publication No. 63 American Lecture Series. A monograph in American Lectures in Physiology. Edited by *Robert F. Pitts*, M.D., Ph.D., Professor of Physiology and Biophysics, Cornell University Medical College, New York City. Fabrikoid. Price, $2.00. Pp. 82 with 14 illustrations. Charles C Thomas, Bannerstone House, 301-327 East Lawrence Ave., Springfield, Illinois, 1950.

Doctor Gray and the publishers are to be congratulated on the publication of this unusually well written monograph.

It is written essentially for physiologists being a monograph in the American Lecture Series in physiology. This does not mean, however, that the monograph will have no appeal for the physician. Pulmonary ventilation, the author points out, is very delicately adjusted to the changing

requirements of the organism. It may be as low as 4 or 5 liters per minute in sleep and as high as 120 liters per minute in violent exercise. Pulmonary ventilation therefore is not a steady rate but a highly flexible one subject to rapid and extensive adjustments to the needs of the moment. Thus an intricate and sensitive control mechanism is required. Dr. Gray states that this control mechanism consists of three integrated parts, a coordinating center, located in the lower brain stem or headquarters, a far flung system of control and peripheral receptors, or spy network, and an effector system, or operations division. The study of such regulations not only constitutes the essence of physiology, but provides the basis for the physician's intelligent comprehension of the operation of the human body in health and disease. Dr. Gray states it is the purpose of this monograph to describe this respiratory control system and to show how it serves to provide the metabolizing tissues with their requirements for gas exchange, and to maintain the organism in spite of various threats to its existence. In this the author has done well.

The monograph is divided into eight sections: section one, the control of the respiratory cycle; section two, theories of the control of ventilation; section three, the receptor system; section four, inter-relationships between chemical stimuli; section five, respiratory responses to chemical stimuli; section six, the integrated regulation of ventilation; section seven, dissociation and unsteady states; and section eight, sensitivity and CO_2 adaptation. In addition there is an excellent list of references.

The subject matter is not only logically presented but written in clear concise English and is devoid of useless verbiage. This monograph could well serve as a model for those presenting similar work. This work is highly recommended to physiatrists and physical therapists.

THE CEREBRAL CORTEX OF MAN. A CLINICAL STUDY OF LOCALIZATION OF FUNCTION. By *Wilder Penfield*, C.M.G., M.D. (Johns Hopkins), B.Sc., and D.Sc. (Oxon.), Hon. F.R.C.S. (London), F.R.S., Professor of Neurology and Neurosurgery, McGill University; Director, Montreal Neurological Institute, and *Theodore Rasmussen*, M.D., Professor of Neurological Surgery, the University of Chicago. Formerly, Lecturer in Neurosurgery, McGill University, Assistant Surgeon, Montreal Neurological Institute. Cloth. Price, $6.50. Pp. 248 with 121 illustrations. The Macmillan Company, 60 Fifth Ave., New York 11, 1950.

This book by Penfield and Rasmussen should find a ready welcome from physiologists, psychologists and neuroanatomists. The evidence presented has been secured from man as a result of surgical procedures. Material is drawn from approximately 400 craniotomies under local anesthesia. The authors state that the neurosurgeon soon gains the impression that in dealing with the cerebral cortex he is still at a distance from the highest level of integration. The purpose of the book has to do with the role of the cortex in sensory perception, motor mechanism, memory recording, and dreams. A report is also made of vocalization and the arrest of speech. Tentative observations are made regarding the part played by certain areas of the cortex in the elaboration of skilled performance. As a preparation of the book a complete review and analysis of records is made during a period of nineteen years.

The chapters are as follows: one, historical note and methods; two, sensorimotor representation of the body; three, head and eye movements; four, representation of autonomic systems; five, vocalization and arrest of speech; six, secondary sensory and motor representation; seven, vision; eight, hearing and equilibration; nine, memory, sensory perception, and dreams; ten, excision of cortical regions; and eleven, general conclusion. There is an excellent bibliography and case index appended.

The book is easily read, well written and a most valuable contribution to this fascinating branch of neuroanatomy. The book will not interest the majority of physicians but should be most valuable to the physiatrist interested in neurology. It is highly recommended.

BIOLOGICAL STANDARDIZATION. By *J. H. Burn*, Professor of Pharmacology in the University of Oxford; *D. J. Finney*, Lecturer in the Design and Analysis of Scientific Experiment in the University of Oxford, and *L. G. Goodwin*. Second edition. Cloth. Price, $6.75. Pp. 440, with 77 illustrations. Oxford University Press, 114 5th Ave., New York 11, 1950.

The first edition of this book in 1937 exerted an immense influence for the good in pharmacology and therapeutics because it attacked with such admirable directness the difficult problem of assaying drugs like digitalis and insulin, whose concentration cannot be determined by chemical tests but must be determined by their effects on living animals or plants. The second edition contains a substantial new chapter on statistical analysis by Finney and five chapters on applications in chemotherapy by Goodwin.

The subject might also be described as "quantitative methods in pharmacology and chemotherapy." Successive chapters deal with hypophyseal extracts and other hormone preparations, vitamin D, digitalis and related drugs, antipyretics and analgesics, atropine substitutes, local anesthetics, certain gastrointestinal hormones, quinidine substitutes, curare-like compounds and a long list of substances used in chemotherapy.

This book is of interest to everyone concerned with the progress of physical medicine because the methods here exemplified need so urgently to be applied to the evaluation of the physiatrist's work. New methods of diagnosis and treatment are still being published, and sometimes widely used, without systematic appraisal of their reliability and effectiveness. Such appraisal is not always difficult, and might well follow the patterns set by this excellent book.

ROSE'S LABORATORY HANDBOOK FOR DIETETICS. Revised and Rewritten by *Clare Mac Taylor*, Ph.D., Professor of Nutrition, Teachers College, Columbia University, New York, and *Grace MacLeod*, Ph.D. Fifth edition. Cloth. Price, $5.00. Pp. 358. The Macmillan Company, 60 5th Ave., New York 11, 1949.

In this fifth edition it has been necessary to reorganize completely the various tables of food values in order to incorporate as much of the more recent quantitative data on food composition as seemed reliable and useful to the teacher, the community and public health nutritionist, the hospital dietitian, the advanced student of nutrition, and the many persons who for one reason or another are interested in the quantitative aspects of our food supply and its nutritive value.

The book has been divided into four parts. Part I includes a brief discussion of the functions of food and food requirements for normal individuals under varying conditions of age and activity. Part II deals with problems in dietary calculation. Part III is made up of useful reference tables. Part IV includes all the tables of food composition.

RECENT ADVANCES IN NUTRITION. By *Paul R. Cannon*, Ph.D., M.D., Chairman of the Department of Pathology, University of Chicago. In Collaboration with Earl P. Benditt, M.D.; Laurence E. Frazier, M.D.; Eleanor M. Humphreys, M.D.; Harold C. Steffee, M.D., Ph.D.; Robert W. Wissler, M.D., Ph. D., and Robert Woolridge, M.A. Porter Lectures. Series 14. Cloth. Pp. 73. Price, $2.00. University of Kansas Press, Lawrence, Kansas, 1950.

This work is chiefly concerned with the role of the amino acids in nutrition and in relation to resistance to infection. Though "caloric intake" and the importance of vitamins are not ignored the chief topic is the vital role of the essential amino acids in the maintenance of adequate protein reserves and in resistance to infection. The author also touches upon the bearings of the new knowledge upon medical treatment during illness or after surgery.

VOLUNTARY PREPAYMENT MEDICAL CARE PLANS. Revised 1950. Paper. Pp. 137. Council on Medical Service, American Medical Association, 535 N. Dearborn St., Chicago 10, 1950.

This is the latest listing of the voluntary health insurance plans that are sponsored by the medical societies and the hospitalization organizations. This edition lists 78 plans that are operating in 45 states, the District of Columbia and Hawaii. The following information is given for each plan: organization, governing body, medical society approval, area covered, type of contract, income limits, enrollment, benefits, waiting periods, monthly premium, blue cross relationship, change of employment and insignia used. The last item shows by the "Seal of Acceptance" which plans have received the approval of the Council on Medical Service of the American Medical Association.

The collection of this data is a service of the Council of Medical Service of the American Medical Association, and should be valuable to those persons who are interested in this phase of medical economics.

A MANUAL OF ARTIFICIAL RADIOISOTOPE THERAPY. Edited by *Paul F. Hahn*, Cancer Research Laboratories, Meharry Medical College, Nashville, Tennessee. Cloth. Price, $6.80. Pp. 310, with 73 illustrations. Academic Press Inc., Publishers, New York, 1951.

Although much of the material in this book has been published elsewhere, the editor has skillfully welded together contributions by sixteen authors to an impressive presentation of the present status of artificial radioisotope therapy. The subject is thoroughly covered and the chapters are written by authorities in their respective fields. "Terminology and Standards" by R. D. Evans; "Dosimetry" by E. H. Quimby; "Radioactive Colloids" by P. F. Hahn; "Health Physics" by K. Z. Morgan; "Autoradiography" by C. B. Leblond; "Availability of Isotopes" by P. C. Aebersold are a few examples of the wide range of fundamental information presented by leaders in the field of radioactive isotopes. Clinical chapters deal with the treatment of polycythemia vera and the leukemias with radiophosphorus, the use of radioactive iodine in the diagnosis and treatment of hyperthyroidism and carcinoma of the thyroid, the use of radioactive colloids in the treatment of lymphoid-macrophage diseases and tumor therapy by direct infiltration of radioactive colloidal metallic gold. A most useful and instructive chapter on the planning of the isotope program in the hospital concludes the book. The book is well printed and illustrated; it can be highly recommended to anybody interested in this relatively new type of radiation therapy.

NEUROLOGY AND PSYCHIATRY IN GENERAL PRACTICE. Edited by *Henry R. Viets*, M.D. In Collaboration with *C. Charles Burlingame*, M.D.; *Clarence B. Farrar*, M.D., and *Z. M. Lebensohn*, M.D. Cloth. Pp. 150. Price, $3.50. Grune & Stratton, Inc., 381 Fourth Avenue, New York City 16, 1950.

This monograph is based on a symposium presented at the clinical session of the American Medical Association in Cleveland in December, 1950. Although not a substitute for a reference text, it does present to the general practitioner a modern approach to neurological and psychiatric problems. Enough detail is included to allow him to handle the simpler problems and indicates how and when to get the help of a specialist.

Although originally presented as a series of over thirty individual papers, it has been carefully edited so that a smooth, coordinated, easy-to-read manuscript has been obtained. It should be a very popular and useful handbook.

PHYSICAL MEDICINE ABSTRACTS

Planning a Small Radioisotope Program. George W. Reid, and Oscar M. Bizzell.

Indust. Med. & Surg. 19:25 (Dec.) 1950.

Many prospective radioisotope users are unfamiliar with the problems that must be faced when setting up an isotope program. Two of the major difficulties involve an unfamiliarity with nomenclature and with the prerequisites for the safe handling of radioactivity. Although isotopes are valuable tools in research, one should not attempt to use them until thorough training has been acquired.

Adequate preliminary training is essential if one is to avoid pitfalls encountered in the design of radioactive laboratories, purchasing of equipment, drawing of false conclusions from experiments, etc. All aspects of the planned program should be investigated thoroughly before any definite action is taken. Budgetary considerations can be met by careful program planning, careful design of the laboratory, and judicious selection of equipment. Sources of information and assistance are available by means of which starting a small isotopes program can be more readily accomplished.

Capacity of Reinnervated Muscles to Function Efficiently After Prolonged Denervation. Sydney Sunderland.

Arch. Neurol. & Psychiat. 64:755 (Dec.) 1950.

The changes which develop in a muscle which has been deprived of its nerve supply are now well known, though several details relating to the processes involved remain obscure. It is generally recognized, however, that prolonged denervation ultimately leads to a condition which is incompatible with the restoration of useful function, even though the muscle has been satisfactorily reinnervated.

It has been ascertained that complete or very good restoration of function can occur in reinnervated human muscles after denervation for at least 12 months as the result of nerve severance, providing that the axons can be directed in sufficient numbers to their original or functionally similar endoneurial tubes and end organs and that the quiescent muscle has been maintained in the best possible condition by appropriate therapy. From this it is concluded that the duration of the denervation and the changes induced in the muscle do not assume significance as regards irreversibility within the first 12 months of denervation.

The most potent factors responsible for the residual defect in muscle function after nerve suture are those which lead to a reduction in the number of functionally effective axons which reach the muscle. Such factors are (a) retrograde neuronal degeneration, which results in a reduction in the number of surviving axons; (b) denervation atrophy of the distal stump and the contained funiculi, which results in the failure of regenerating axons to reach the endoneurial tubes of the distal stump; (c) factors responsible for the erroneous cross shunting of regenerating axons, so that the latter fail to find, enter and descend along appropriate, i. e., corresponding or functionally similar, endoneurial tubes in the distal stump.

Additional factors which may operate below the level of the lesion are (a) changes developing in the muscle as a result of the denervation which may reduce the chances of restoring useful neuromuscular connections or produce a condition in individual muscle fibers which is incompatible with normal functioning after satisfactory reinnervation, and (b) changes in the distal stump which delay or prevent the conversion of axonal pathway into a functionally efficient fiber.

The available evidence, however, suggests that these two factors do not assume significance within the first 12 months of denervation.

Manipulative Treatment. Matthew B. Day.

Brit. J. Phys. Med. 13:241 (Nov.) 1950.

It might well be asked why manipulative treatment, being essentially craftsmanship and therefore a surgical procedure, is included in the ambit of physical medicine. The reply is that it is concerned with the passive movement of joints, frequently at a single sitting, and is thus often a necessary prelude to further efforts on the part of the physical therapist.

Because the vast majority of manipulations can only be successfully carried out under a general anesthetic, they are naturally outside the scope of the physical therapist. Skill in the performance of the various manipulations can only be acquired after much practice, so that work of this kind tends to be more or less restricted to those who have gained experience in this branch of the medical art.

Acrosclerosis. T. R. Littler, and S. Canter.

Lancet 6647:139 (Jan. 20) 1951.

Acrosclerosis is relatively rare, and there is much conflict of opinion about whether it is an independent clinical syndrome or not. Acrosclerosis, scleroderma, scleroedema adultorum, and dermatomyositis have been grouped together as dermatosclerosis, because hardening of the skin is common to all of them at some time during their course. The earliest manifestations of acrosclerosis are the Raynaud phenomena, and, until

the skin changes appear the diagnosis of acrosclerosis does not arise. Superficial examination may lead to a momentary confusion with rheumatoid arthritis. Raynaud phenomena are seen in both conditions, and the ulnar deviation and position of flexion of the fingers are common to both. Closer examination, however, confirms that the changes are not primarily articular or periarticular, and any deformities that have arisen are due to the contraction of the skin over the underlying tissues.

There is no satisfactory treatment of acrosclerosis. Acrosclerosis may partly regress, even after many years. On general principles most workers recommend residence in a dry and equable climate, and a well-balanced nutritious diet. Protection of the fingers from trauma, including immersion in cold water, and the avoidance of psychological trauma are also advised. Physical therapy is important; radiant heat and massage, together with active and passive movements, encourage the patient and should be tried in all cases.

The Medical Care of the Elderly. T. N. Rudd.

Lancet **6646**:101 (Jan. 13) 1951.

No one who reads the medical papers can fail to be impressed by the number of careful reports on conditions of the elderly, sick and healthy, in hospitals and in their own homes, throughout the country. Conditions of neglect under which the aged live have been noted in this country and in the United States of America.

The ultimate problems for scientists are the reasons for ageing, and its prevention. These may never be solved, but we can at least learn more of the variations of disease in old age. Important changes of attitude are now becoming general: rehabilitation, especially, has come right to the fore, but it can only be successful if based upon a sound and complete diagnosis. Family physicians with a large list of older patients need increased diagnostic facilities which usually cannot be met by the general hospital out-patient department: geriatrics outpatient departments will be required, preferably in geriatric hospitals. In some hospitals, where there is no physical therapy department, the geriatric out-patient department should be linked up with an outside physical therapy clinic. However, massage should be given by personnel on the geriatrics staff whose methods are geared down to the needs of the elderly.

Effect of Postoperative Bed Rest and Early Ambulation on the Rate of Venous Blood Flow. H. Payling Wright; S. B. Osborn, and Denise G. Edmonds.

Lancet **6645**:22 (Jan. 6) 1951.

One hundred and seventeen surgical patients were investigated preoperatively and at weekly intervals during convalescence. Records were obtained from 42 of these at the end of the operation while the patient was still anesthetized in the theater. Since anesthesia was produced by various means and combinations of drugs and for differing times, no conclusions can be draw as to the effects of different anesthetics on the flow-rates.

For the analysis of the data obtained during the postoperative period, observations were separated into two main divisions: (1) those made on patients who were ambulant at the time the record was taken; and (2) those made on patients who had remained uninterruptedly in bed since the operation.

In the patients who were ambulatory during convalescence, no slowing of venous flow was apparent in either leg or arm. In patients confined to bed, a reduction of flow-rate, which was most marked at 10 to 12 days after operation, was found. Changes in flow-rate were always greater in the leg than in the arm. Observations on patients from whom pelvic masses were removed suggested that the alleviation of intra-abdominal pressure had a greater influence than postoperative ambulation on venous flow-rate. The importance of venous stasis in relation to postoperative thrombosis is discussed.

Multiple Sclerosis: A Correlation of Its Incidence with Dietary Fat. Roy Laver Swank.

Am. J. Med. Sci. **220**:421 (Octo.) 1950.

In a discussion of factors which influence the incidence and character of the disease multiple sclerosis, the variations in its geographic incidence deserve special consideration. The prevailing concept that the disease is more common in northern and colder than in southern and warmer climates is based on incomplete and inadequate evidence, but the absence of a known cause of multiple sclerosis forces us to examine this evidence more closely.

In an epidemiologic study of multiple sclerosis in Europe, changes in the nutrition before, during, and since the war have been correlated with the yearly incidence of the disease during this same period. These data, plus other collected observations, suggests that possibly the incidence of the disease in entire populations may be related directly to the dietary fat. It seems clear from the observations presented in this paper, as well as from unreported clinical studies, that a high fat diet is not the cause of multiple sclerosis even though it may contribute to a high incidence of the disease by accelerating it in susceptible individuals.

Treatment of Peripheral Arteriosclerosis Obliterans: Physical Agents. Albert Fields.

Am. Pract. 1:1156 (Nov.) 1950.

In the attempt to relieve the symptoms of impaired peripheral circulation there is an increasing tendency toward indiscriminate use of physical therapy.

Walking is usually contraindicated in the presence of severe pain during rest, discoloration of sudden onset, rapid increase in discoloration, and in the presence of gangrene or ulceration. According to Wright, the optimum rest position for

the extremities is three to six inches below the heart.

It has not been proved that postural exercises do increase the blood flow. However, if these exercises do not make too great demands on the individual, they are of value by reminding him that he has impaired circulation, and must take better care of his extremities.

Using a Sanders bed, best results were obtained with room temperature of 85 F. and elevation of the head of the bed so that the feet are just a few inches below the level of the heart.

However, improved exercise tolerance and eradication of intermittent claudication should not be expected.

Despite reported good results in occasional cases, "pavaex" is of questionable value and is contraindicated in the presence of gangrene, ulcers or infections.

Probably the popularity of therapy is related to its availability, simplicity, and the fact that the patient can run the machine by himself at home. Its value has not been verified by controlled clinical experiments and in the future it will be little used.

Light massage (effleurage) for 15 minutes twice daily has a beneficial action by producing superficial capillary dilatation without increasing metabolism. Deeper massage increases venous return and lymph flow along with arterial flow but, if too vigorous, may increase metabolism and further injure already damaged tissues. Massage and gentle, slow, passive stretching or traction also helps to relieve fibrositis and painful muscle spasms. Mechanical massagers and vibrators are mentioned only to be condemned.

Harpuder and others see no justification for the alternate use of hot and cold baths.

Regarding whirlpool baths, it is doubtful that any form of bath can produce a prolonged improvement of circulation. However, as long as the water used is neither too hot nor too cold, the baths are not harmful, and many patients continue with this therapy because they think they are benefited by it.

Obviously, the patient with impaired circulation should not follow any occupation involving exposure to cold.

Fields believes that it is unsafe to apply heat in any form to extremities with impaired arterial circulation. With thermostatically controlled sheets and blankets, mild heat can be applied to the whole body for prolonged periods with comfort and safety.

It is generally inadvisable to use diathermy on a limb with impaired circulation. It is safer to apply diathermy to the lumbar region, thus increasing blood to the lower extremities indirectly.

The Prevention and Treatment of Thrombophlebitis. C. J. Gavey.

Practitioner **166**:260 (March) 1951.

Medical diseases are now known to rank as high as surgical in the precipitation of thrombophlebitis. Acute rheumatism is no longer an important cause of thrombosis but the old books contain numerous examples. Metabolic diseases such as gout used often to be incriminated, but that disease itself, and complication, is now rare. In diabetes, thrombophlebitis usually complicates gangrene. Parapiegic patients are liable to thrombophlebitis in the lower limbs, especially poliomyelitis victims in Drinker respirators. An awareness of this complication may lead to successful physical therapy.

After operation for thrombophlebitis the main preventive measure is mobilization of the lower extremities as soon as possible. Haines has provided evidence of the beneficial effect of early active movement and massage on the incidence of emboli in postoperative gynecological cases. Early rising after operation is recommended but this must not be carried too far, and if the patient complains of faintness after getting up, more harm than good is done. Breathing exercises are valuable in aiding venous return and so reducing stasis. Preoperative training in this should be encouraged.

In the local management of postoperative thrombophlebitis hot packs allay pain. Elevation of the limb is desirable, provided it is comfortable, and, after three days, allowed for the clot to adhere firmly to the vein wall, exercises are begun. Ambulation of the patient is started slowly when only conservative treatment has been given, or more quickly when anticoagulants are administered.

New varicosities often appear after thrombophlebitis and prolonged support is necessary, but the ultimate result may be unexpectedly good after years of treatment, especially in youth. In older subjects the delayed effects may be progressively crippling. Graduated exercises and swimming, if possible, are indicated. Anticoagulants have added a powerful weapon against the effects of thrombophlebitis, but there are contraindications to their use, and considerabe judgment is required as to whether or not to enlist their help in a particular case. It should be remembered that anticoagulants may not only save life but prevent or reduce crippling venous stasis in the years that follow.

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APPROVED SCHOOLS FOR PHYSICAL THERAPISTS *

Council on Medical Education and Hospitals of the American Medical Association

Name and Location of School	Medical Director and Technical Director	Entrance Requirements **	Duration of Course	Time of Admission	Maximum Enrollment	Tuition	Certificate, Diploma, Degree
Childrens Hospital, Los Angeles[1]	S. S. Mathews, M.D. Mrs. Sarah S. Rogers	a-b-d	14 mos.	Sept	14	$300	Cert. or Degree
College of Medical Evangelists, Los Angeles[1]	Fred B. Moor, M.D. R. William Berdan	a-b-c	15 mos.	Sept	16	$300	Cert. or Dipl.
University of Southern California, Los Angeles[1, 5]	Charles L. Lowman, M.D. Miss Charlotte W. Anderson	a-b-e c-d-HS	14 mos. 1-4 yrs.	Sept SeptFeb	20	$662 $18 per unit[7]	Certificate Cert. & Degree
University of California Hospital, San Francisco[1]	Lucile M. Eising, M.D. Mrs. Margery L. Wagner	d	12 mos.	Sept	15	$220[3]	Cert. or Degree
Stanford University, Stanford University, Calif.[1]	W. H. Northway, M.D. Miss Lucille Daniels	a-b-d	12 mos.	Varies	15	$620	Cert. or Degree
University of Colorado Medical Center, Denver[1]	Harold Dinken, M.D. Miss Mary Lawrence	a-b-d	12 mos.	Sept	12	$300[3]	Cert. or Degree
Northwestern University Medical School, Chicago	Emil D. W. Hauser, M.D. Miss Gertrude Beard	a-b-d	12 mos.	Oct	10	$450	Certificate
State University of Iowa Medical School, Iowa City[1]	W. D. Paul, M.D. Mrs. Olive Farr	e	12 mos.	Sept	15	$200	Certificate
University of Kansas School of Medicine, Kansas City[1]	Donald L. Rose, M.D. Mrs. Ruth G. Monteith	a-b-d	12 mos.	FebSept	15	$ 80[3]	Cert. or Degree
Bouvé-Boston School of Physical Education, Medford, Mass.	Howard Moore, M.D. Miss Constance Greene	H.S.	4 yrs.	Sept	15	$550	Dipl. & Degree
Simmons College, Boston	W. T. Green, M.D.	H.S.-e	1½-4½ yrs.	Sept	25	$550	Dipl. or Degree
Boston University College of Physical Education for Women, Sargent College, Cambridge, Mass.	Kenneth Christophe, M.D. Miss Adelaide McGarrett	H.S.-e-d	1-4 yrs.	Sept	30	$450	Cert. or Degree
University of Minnesota, Minneapolis[1]	Frederic J. Kottke, M.D. Miss Ruby M. Green	H.S.	4 yrs.	Sept	16	$580[3]	Degree
Mayo Clinic, Rochester, Minn.[1]	Earl C. Elkins, M.D. Harry Keown	a-e	12 mos.	Sept	30	None	Certificate
Washington Univ. School of Medicine, St. Louis[1]	Sedgwick Mead, M.D. Miss Beatrice Schulz	c	2 yrs.	Sept	12	$450[3]	Degree
St. Louis University School of Nursing, St. Louis[1]	A. J. Kotkis, M.D. Sister Mary Imelda	H.S.	4 yrs.	JanSept	18	$300	Degree
Albany Hospital, Albany, N. Y.	J. W. Ghormley, M.D. Miss Catherine Graham	a-b-d	12 mos.	Sept	6	$250	Certificate
Columbia University College of Physicians and Surgeons, New York City[1]	William B. Snow, M.D. Miss Floy Pinkerton	a-c-e	1-2 yrs.	Sept	50	$710	Cert. or Degree
New York University School of Education, New York City[1]	George G. Deaver, M.D. Miss Elizabeth Addoms	a[2]-b-d	12 mos.	Sept	40	$500	Cert. & Degree
Duke Hospital, Durham, N. C.[1]	Lenox D. Baker, M.D. Miss Helen Kaiser	a-b-d	15 mos.	Oct	12	$350	Certificate
D. T. Watson School of Physiatrics, Leetsdale, Pa.[1]	Jessie Wright, M.D. Miss Kathryn Kelley	a-b-d	12 mos.	Oct	30	$300	Diploma
Graduate Hospital of the University of Pennsylvania, Philadelphia[1]	George M. Piersol, M.D. Miss Dorothy Baethke	a-b-d	12 mos.	Sept	20	$400	Certificate
University of Texas School of Medicine, Galveston[1]	G. W. N. Eggers, M.D. Miss Ruby Decker	b-d	12 mos.	Jan	8	$163[3]	Certificate
Hermann Hospital, Houston[1]	Oscar O. Selke, Jr., M.D. Mary Elizabeth Kolb	a-b-d	12 mos.	Oct	12	$300	Cert. or Degree
Baruch Center of Physical Medicine of the Medical College of Virginia, in affiliation with Richmond Professional Institute, Richmond[1]	Walter T. Lee, M.D. Miss Susanne Hirt	H.S.-a-b-c-d-e	1-4 yrs.	Sept	54	$275[3]	Dipl. or Degree
University of Wisconsin Medical School, Madison	Harry Bouman, M.D. Miss Margaret A. Kohli	a-b-c H.S.	12 mos. 4 yrs.	FebSept Sept	20 20	$120[3]yr $120[3]yr	Certificate Cert. & Degree
Medical Department — U. S. Army — Medical Field Service School, Brooke Army Medical Center, San Antonio, Texas, and	Charles D. Shields, Lt. Col., M.C. Agnes P. Snyder, Major, WMSC...	h	12[4]	Nov.	20	None	See Below
Fitzsimons Army Hospital, Denver, Colorado or	Harold B. Luscombe, Col. M.C... Harriet S. Lee, Maj., WMSC.....	Completion MFSS	12[4]	June	10	None	Certificate
Walter Reed Army Hospital, Army Medical Center, Washington, D. C.	John H. Kuitert, Colonel, M.C... Brunetta Kuchlthau, Maj., WMSC.	Completion MFSS	12[4]	June	10	None	Certificate
Cleveland Clinic Hospital, Cleveland, Ohio	Shelby G. Gamble, M.D. Miss Mildred Heap	a-b-d	12 mos.	Oct.	12	$200	Diploma

** Courses are so arranged that any of the entrance requirements will qualify students for training. a = Graduation from accredited school of nursing; b = Graduation from accredited school of physical education; c = Two years of college with science courses; d = Three years of college with science courses; e = Four years of college with science courses. H.S. = High school graduation. h = Baccalaureate degree with major in physical education or the biological sciences.

* Reprinted in part with permission, J. A. M. A. 143:114 (May 6) 1950.

1. Male students are admitted.
2. R.N. plus one year college.
3. Nonresidents charged additional fee.
4. 12 months includes training at the Medical Field Service School and Fitzsimons or Walter Reed General Hospitals.
5. Students may transfer into the degree course at the Freshman, Sophomore, Junior or Senior Level. All are held responsible for requirements as listed in curriculum outline. This refers to professional as well as nonprofessional courses.
6. First year—$450. Second year—$325.
7. Masters Degree: 28 units at $20 per unit.

APPROVED SCHOOLS FOR OCCUPATIONAL THERAPISTS

Council on Medical Education and Hospitals of the American Medical Association

NOTE: The duration of the course is expressed in academic years.

Name and Location of School	College Affiliation	Duration of Course	Classes Start	Entrance Requirements	Tuition Per Year	Certificate, Diploma	Graduates in 1947
University of Southern California, 923½ 35th Place, Los Angeles	University of Southern California	2 yrs. 5 yrs.	FebSept FebSept	Degree High sch.	$420 $450	Certificate Cert.&B.S.	22
Mills College, Oakland, Calif.	Mills College	3 yrs.	FebSept	Degree	$200 $550	Certificate	....
San Jose State College, San Jose, Calif.	San Jose State College	1½ yrs. 3¼ yrs.	Varies Varies	Degree High sch.	$ 21 $ 21	Certificate Degree	10
University of Illinois College of Medicine, 1853 W. Polk St., Chicago	University of Illinois	5 yrs.	Feb	High sch.	$152	B.S.	14
University of Iowa, Iowa City, Iowa	State University of Iowa, College of Medicine	5 yrs.	.....	High sch.	$ 85	Cert.&Deg	
University of Kansas, Lawrence	University of Kansas	2 yrs. 4 yrs.	FebSept FebSept	Degree High sch.	$131 $131	Certificate B.S.	10
Boston School of Occupational Therapy, 7 Harcourt St., Boston	Tufts College	2 yrs. 5 yrs.	Sept Sept	Degree High sch.	$500 $450	Diploma B.S.	13
Wayne University, 4841 Cass, Detroit, Mich.	Wayne University, College of Med., Coll. of Liberal Arts, Coll. of Education	5 yrs.	.....	High sch.	.....	.....	
Kalamazoo School of Occupational Therapy, Western Michigan College of Education, Kalamazoo	Western Michigan College of Education	1½ yrs. 4 yrs.	FebSept FebSept	Degree 1 yr. coll.	$127 $127	Diploma Degree	20
Michigan State Normal College, Ypsilanti	University of Michigan	5 yrs.	Varies	High sch.	$118	Cert.&Deg.	8
University of Minnesota, Church Street, Minneapolis	University of Minnesota	4 yrs.	.....	High sch.	$360	B.S.	
College of St. Catherine, St. Paul, Minn.	The College of St. Catherine	3½ yrs.	Varies	1 yr. coll.	$210	Degree	4
Washington University School of Medicine, St. Louis	Washington University	3 yrs.	Sept	2 yrs. coll.	$400	Degree	10
University of New Hampshire, Durham	Univ. of New Hampshire	5 yrs.	Sept	High sch.	$160	Cert.&Deg.	6
Columbia University College of Physicians and Surgeons, 630 W. 168th St., New York City	Columbia University	1½ yrs. 2½ yrs.	Sept Sept	Degree 2 yrs. coll.	$450 $450	Certificate Degree	28
New York University School of Education, 100 Washington Sq. E., New York City	New York University	4½ yrs.	FebSept	High sch.	$500	Cert.&Deg.	20
Ohio State University, Columbus	Ohio State University	3 yrs.	Quarterly	High sch.	$105	Degree	21
Philadelphia School of Occupational Therapy, 419 S. 19th St., Philadelphia	University of Pennsylvania	1½ yrs. 3 yrs.	Sept Sept	Degree 1 yr. coll. High sch.	$500 $500 $600	Diploma Diploma	35
Texas State College for Women, Denton, Tex.	Texas State College for Women	5 yrs.	FebSept	High sch.	$150	Degree	13
Richmond Professional Institute, 901 W. Franklin St., Richmond, Va.	Medical College of Virginia	1½ yrs. 3 yrs.	Sept Sept	Degree 1 yr. coll.	$200 $200	Certificate Certificate	20
College of Puget Sound, Tacoma, Wash.	College of Puget Sound	3 yrs. 5 yrs.	FebSept FebSept	Degree High sch.	$350 $300	Certificate Cert.&Deg.	
University of Wisconsin, Madison	University of Wisconsin	4 yrs.	FebSept	High sch.	$320	Cert.&Deg.	8
Milwaukee-Downer College, Dept. of Occupational Therapy, 2512 E. Hartford, Milwaukee	Milwaukee-Downer College	2½ yrs. 4 yrs.	Sept Sept	1 yr. coll. High sch.	$300 $300	Diploma Dipl.&Deg.	22
Mount Mary College, 2900 Menomonee River Dr., Milwaukee		Varies	Sept	Degree	$335	Certificate	15
University of Toronto, Dept. of University Extension, Toronto, Ont., Canada	University of Toronto	5 yrs. 3 yrs.	Sept Sept	High sch. 1 yr. coll.	$260 $222	B.S.Deg. Diploma	110
Colorado Agricultural and Mechanical College, Fort Collins, Colorado		5 yrs.	Sept	High sch.	.....	B.S.	

MEETINGS OF INTEREST
TO THOSE IN THE
FIELD OF PHYSICAL MEDICINE AND REHABILITATION

In this column will be published information about meetings of interest to those in the field of physical medicine. New data should be sent promptly to the office of the ARCHIVES, 30 North Michigan Avenue, Chicago 2, Illinois.

American Congress of Physical Medicine. — 29th Annual Session, Shirley-Savoy Hotel, Denver, Colo., Sept. 4, 5, 6, 7, 8, 1951. Walter J. Zeiter, M.D., Chairman, Convention Committee, 30 North Michigan Ave., Chicago 2.

Section on Physical Medicine and Rehabilitation of the American Medical Association. — Wednesday, Thursday and Friday morning of the A.M.A. meeting (June 11-15, 1951) in Atlantic City. Secretary, Walter J. Zeiter, M.D., Cleveland Clinic Foundation, 2020 E. 93rd Street, Cleveland 6, Ohio. *See announcement, elsewhere, this issue.*

Chicago Society of Physical Medicine and Rehabilitation. — Meetings, fourth Wednesday, January, through May, 1951. Next meeting Wednesday, May 23. *See announcement, elsewhere, this issue.* Arthur A. Rodriquez, M.D., Secretary, 30 North Michigan Ave., Chicago 2.

New Jersey Society of Physical Medicine. — Meetings, fourth Wednesday. James C. Hanrahan, M.D., Secretary, 678 N. Broad St., Elizabeth 3, N. J.

New York Society of Physical Medicine. — Meetings, first Wednesday. Madge C. L. McGuinness, M.D., Secretary, 48 E. 62nd St., New York 21, N. Y.

Pennsylvania Academy of Physical Medicine. — Meetings, third Thursday. Charles Furey, Jr., M.D., Secretary, 2501 S. Cleveland Avenue, Philadelphia 45, Pa.

The National Society for Crippled Children and Adults, Inc. — 1951 annual convention, Palmer House, Chicago, October 3, 4, 5 and 6, 1951. Lawrence J. Linck, Executive Director, 11 So. La Salle St., Chicago 3.

American Physical Therapy Association. — Glenwood Springs, Colo., Hotel Colorado, June 17-22, 1951. Mildred Elson, Executive Director, 1790 Broadway, New York 19, N. Y.

American Occupational Therapy Association. — Annual Convention, Sept. 8 to 15, Durham, N. H., Wentworth-by-the-Sea Hotel. Co-chairmen, Eleanora Chernewski, VA Hospital, Togus, Maine, and Margaret L. Blodgett, U. S. Marine Hospital, Brighton, Mass.

International

International Congress of Physical Medicine (1952). London, July 14 to 19, 1952. Applications for the provisional program should be addressed to the Honorary Secretary, Dr. A. C. Boyle, International Congress of Physical Medicine (1952) 45, Lincoln's Inn Fields, London, W.C. 2.

European Congress on Rheumatism — Barcelona, Spain, Sept. 24-27, 1951. Dr. Gunnar Edstrom, Lund, Sweden, Secretary.

International Gerontological Congress. — Hotel Jefferson, St. Louis, Mo., U. S. A., Sept. 9-14, 1951. Dr. John E. Kirk, 5600 Arsenal Street, St. Louis 9, Mo., Chairman, Program Committee.

International Poliomyelitis Congress. — Copenhagen, Denmark, Sept. 2-7, 1951. Prof. Niels Bohr, Statens Seruminstitut, 80 Amager Blvd., Copenhagen S., Denmark, President.

International Society for the Welfare of Cripples. — Fifth World Congress, Stockholm, Sweden, Sept. 10-14, 1951. Mr. Donald V. Wilson, 54 E. 64th St., New York 21, N. Y., U. S. A., Executive Director.

World Confederation for Physical Therapy. — Sept. 7 and 8, 1951, Copenhagen. Further information may be obtained from Miss M. J. Neilson, Convener and Secretary, Provisional Committee, World Confederation for Physical Therapy, Tavistock House North, Tavistock Square, London W. C. 1, England.

Tenth International Congress of Industrial Medicine. — Lisbon, Portugal, Sept. 9th to 15th, 1951. Secretary, Prof. L. Carrozzi, Instituto Nacional do Trabalho e Previdência, Praça do Comércio, Lisbon.

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